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SERIE: FISKERI · BIND XI

NR. 2. E. BERTELSEN: CONTRIBUTIONS TO THE BIOLOGY OF THE COALFISH (*GADUS VIRENS* L.) IN FAROE WATERS

KØBENHAVN
C. A. REITZELS FORLAG
BIANCO LUNOS BOGTRYKKERI A/S
1942

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CONTRIBUTIONS TO THE BIOLOGY OF THE COALFISH (*GADUS VIRENS* L.) IN FAROE WATERS

WITH SPECIAL REGARD TO THE YOUNGEST AGE GROUPS

BY

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1942

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Introduction.

The present paper is mainly based on collections and extracts from the journals of the cruises in the northern Atlantic made since 1903, when "The Danish Committee for Fisheries Investigations and the Study of the Sea" started to send out research vessels under the leadership of Professor Dr. phil. Johs. Schmidt and after his death in 1933 Dr. phil. Å. Vedel Tåning.

As may be seen from the first table, research vessels or hired vessels etc. have in all visited the Faroes in 20 different years between 1903 and 1939. Investigations with special regard to the coalfish were not made on these cruises, but, independently of the varying main tasks, all species of fish in the samples secured were noted in the journals as far as possible with indication of number, size and sex. As a rule all the coalfish were measured. When in some cases this species has been especially numerous only a representative sample has been dealt with, and in a few others, only the number, and the lengths of the largest and smallest individuals are recorded. As the coalfish is one of the most frequent fish in Faroe waters a very considerable number of such data in course of time has been collected.

Participating in the cruises of 1932, 1938 and 1939 the author has had the opportunity of studying the collecting-methods practised and making some others observations which have been useful in estimating the value of the material.

The results of the pelagic collections from 1903—1908 have been published by Johs. Schmidt as parts of his fundamental work on the distribution of the pelagic fry and the spawning regions of the Gadoids (Schmidt 1904, 1905 & 1909).

The material at hand contains both pelagic coalfish fry and coalfish of the youngest 3 age-groups from the littoral zone of the fjords, and also adult coalfish from greater depths in the surrounding waters.

From 1903—1910 the Petersen young fish trawl was mostly used for pelagic collections, but later this gear was replaced by the 2 m ring trawl, called "S. 200" in the tables and figures, i. e. a conical stramin net 200 cm in diameter at the opening. Young coalfish from the littoral region of the fjords have been caught by eel hand seine, a large small-meshed seine, which was usually set out from a row boat and then dragged on land ("Aa." in the tables and figures).

Table 1 gives the number of stations, where young fish trawl or ring trawl and eel hand seine have been used from 1903 to 1939. All the collections were made during the summer, the majority in May and August. Each pelagic station includes as a rule 2 hauls from different depths. As the coalfish fry leaves the plankton and seeks the coast rather early, the following sections on the spawning and of the pelagic fry are based especially on collections from 1934 and 1935 when the area was visited also early in the spring. The fish fry caught has, as

Table 1.

Total number of pelagic stations (S. 200) and eel hand seine stations (Aa.) at the Faroes 1903—1939.

Year	Vessel	March		April		May		June		July		Aug.		Sept.		Total No.	
		S. 200	Aa.	S. 200	Aa.	S. 200	Aa.	S. 200	Aa.	S. 200	Aa.	S. 200	Aa.	S. 200	Aa.	S. 200	Aa.
1903	„Thor"	..	..	..	..	7	..	..	..	..	..	15	3	2	2	24	5
1904	—	..	..	2	..	28	4	..	..	1	..	8	..	1	..	40	4
1905	—	..	..	..	..	10	..	..	..	5	1	..	..	..	..	15	1
1908	—	..	..	..	..	..	..	..	..	..	..	3	1	..	..	3	1
1910	—	..	..	..	2	16	5	3	..	..	..	..	..	..	..	19	7
1911	—	..	..	..	..	..	..	..	..	..	..	..	3	..	3	0	6
1912	—	..	..	..	..	..	3	..	1	..	3	..	9	..	..	0	16
1913	"Margrethe" ..	..	..	..	..	9	3	16	3	..	..	..	..	..	..	25	6
1924	"Dana".....	..	..	..	..	16	5	..	..	..	..	21	8	..	..	37	13
1925	—	..	..	..	..	14	4	..	..	..	..	7	5	..	..	21	9
1926	—	..	..	..	..	16	5	13	1	..	..	21	4	..	..	50	10
1927	—	..	..	..	..	..	..	28	4	8	..	16	6	9	2	61	12
1931	—	..	..	..	..	..	..	..	..	..	..	10	3	..	..	10	3
1932	—	..	..	..	..	..	..	14	6	2	..	7	8	..	..	23	14
1933	—	..	..	..	..	..	..	..	..	9	2	9	2	9	1	27	5
1934	—	..	..	22	6	57	4	..	..	31	3	..	..	..	..	110	13
1935	"Louise".....	8	..	20	..	..	..	..	..	..	..	..	..	..	..	28	0
1937	"Amy"	..	..	..	..	..	..	..	..	..	..	22	2	..	..	22	2
1938	"Dana".....	..	..	..	..	11	..	..	..	2	2	1	3	..	..	14	5
1939	—	..	..	..	..	..	..	..	..	9	..	4	4	..	..	13	4
Total for 20 Years ...		8	0	44	8	184	33	74	15	67	11	144	61	21	8	542	136

a rule, been preserved in formaldehyde and brought home. The measuring of the coalfish has therefore in some cases been done in the laboratory when no time could be spared for measuring on board.

Only a few places in the Faroe fjords are suitable for fishing with eel hand seine, and as the leading idea was that the collections from different years should be comparable, the 136 stations are spread over a rather small number of different localities (fig. 1) some few of which have been visited only once or twice. Each eel hand seine station includes a variable number of hauls; in all 800 hauls have been carried out. With very few exceptions these hauls contain young coalfish, of which about 47.000 have been measured (Appendix. Tables I—X). A small number of samples were preserved and brought home, and in some cases samples of scales were taken from the larger specimens.

The material of older coalfish from the Faroe area is very scarce, as in our trawling catches the coalfish is only exceptionally found in the summer. The fish were as a rule only measured and a total of 61 scale samples were brought home.

The material is as mentioned, a part of collections made with special regard to the most important food fish, and it was found that supplementary collections and special investigations were desirable before finishing the work. These investigations were planned for the spring and summer of 1940 but had to be postponed on account of the war.

While working up the material at the "Marinbiologisk Laboratorium" I received valuable

advice from its leader, Dr. phil. Å. Vedel Tåning, to whom I also wish to express my thanks for putting the material at my disposal.

My thanks are due to Dr. Cyril Crossland for his careful and very valuable help in the translation of this paper.

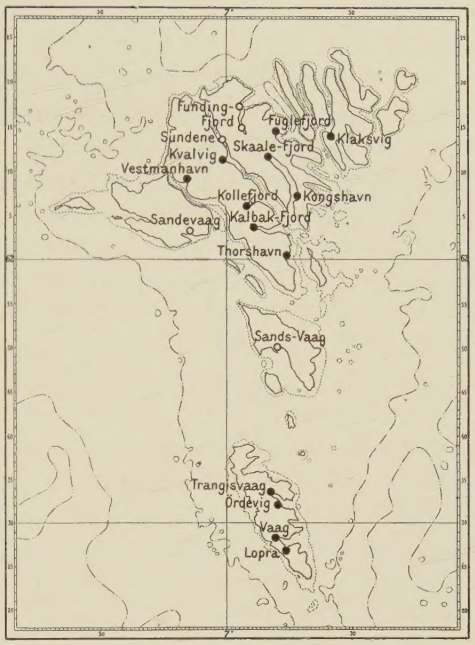

Fig. 1. All localities at the Faroes examined with eel hand seine 1903—1939. Open circles denote those which have only been visited once or twice.

I. Spawning.

As proved by Schmidt (1909 p. 141) and Damas (1909 p. 176) the coalfish spawns at a depth of 100—200 m off the British Atlantic coast, in the northern part of the North-Sea, along the western shore of Norway to about 65° N. lat., at the Faroes and off the Southern and S.W. coast of Iceland. It is generally supposed that the spawning of the coalfish in these areas takes place in the four first months of the year. Off Scotland (Fulton 1892) ripe and spent coalfish appear in January, and off Norway (Damas 1909 p. 169), coalfish eggs are found abundantly in the beginning of February. Off Iceland the spawning begins somewhat later. Sæmundsson (1908 p. 54) has found ripe specimens in the end of February and spent coalfish in the middle of March, and he therefore concludes that the spawning here begins towards the end of February.

Accurate record as to when spawning begins at the Faroes is missing. Schmidt (1904 p. 83) remarks, that "coalfish carrying roe, are according to report, hardly known by the fishermen" — and no pelagic collections were carried out at the Faroes during the first two months of the year. The time of spawning can therefore only be roughly estimated from the earliest spring observations on the size of the fry.

The earliest collections of pelagic coalfish fry in these waters were made between the 27th of March and the 7th of April 1935. In all 612 specimens were caught, distributed on 28 stations, the length varying from 3,5—10 mm with an average of 5,4 mm.

The composition of this sample does not give quite accurately the size of the coalfish fry at the Faroes between these dates. As the majority of the stations investigated is within the fjords, where the fry must have drifted from the spawning places, the material includes too small a percentage of the youngest larval stages. Three stations lie on the Suderø Bank over the depths where the spawning is likely to take place, and the collection from these stations therefore is reckoned as more characteristic. According to Schmidt (1909 p. 7) we must, it is true, suppose that a greater part of the early larval stages with yolk sac are so delicate that they are usually destroyed or spoilt in the ring trawl. On the 28th of May a total of 166 coalfish were caught here. The lower frequency curve in fig. 2 shows the distribution in length of these, they vary from 3,5 to 8,5 mm, with an average length of 5,0 mm. The curve is oblique because the small newly hatched larvae dominate the sample. The smallest specimens are 3,5 mm long, and the obliqueness of the curve is therefore less marked if the material, as usual, is measured to the "mm below", as the class interval "3 mm" will contain only

individuals between 3,5 and 4 mm. In this special case the class limits 3,5, 4,5 etc. therefore were used.

This size distribution indicates that the hatching did not culminate at this time; if the culmination had passed, a curve with maximum at a higher value would be expected. As the time of incubation may be 10—12 days (Macintosh and Masterman 1897 p. 267, Bigelow and Welsh 1925 p. 405) this means that the spawning in 1935 at any rate did not culminate before the middle of March.

In 1934 in all 5931 coalfish fry were caught between the 22nd of April and 6th of May, distributed over 46 stations in the area of the Faroes. The length varied from 3,5 to 17,5 mm, with an average of 8,8 mm. On the 3 stations at Suderø Bank mentioned before, 2268 coalfish were caught on the May 1st. The average length and length composition here did not differ from the total sample. The upper frequency curve, stippled in fig. 2, is nearly symmetrical with a modal length of about 9 mm. 40 % of the specimens from 28th of May 1935 measured less than 4,5 mm, whereas these youngest larvae only represented about 1 % on May 1st 1934. Accordingly the hatching has at this date nearly finished, and the spawning may therefore have nearly ceased in the latter half of April.

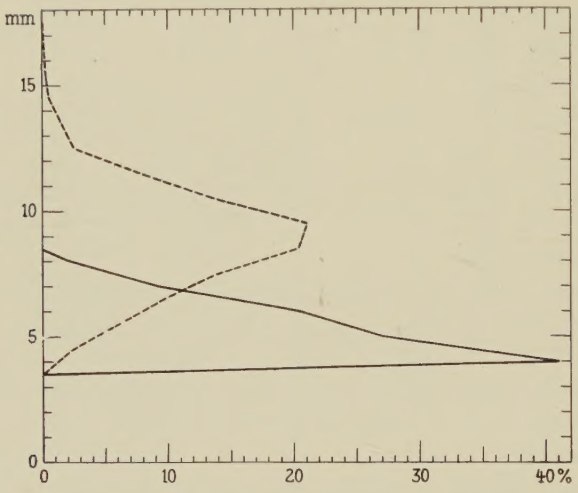

Fig. 2. Percentage length frequency of pelagic coalfish fry from Suderø Bank.
———— 28th of March 1935.
---------- 1st of May 1934.

As the spawning periods in 1934 and 1935 possibly were slightly different, only an approximate determination of the growth of the coalfish fry can be based on the samples available. If the hatching in 1934 also did not culminate till after April 1st the most frequent size of the sample of May 1st i. e. specimens of about 9 mm, was in consequence up to a month old. Even if a lower rate of growth is presumed for the larger fry caught about 1st of April 1935, these can hardly have been spawned before the beginning of February.

Schmidt (1909 p. 39) found coalfish eggs at the Faroes in April and May 1904, at latest some few eggs on the 16th of May. In the material at hand no coalfish less than 4 mm appear later than on May 1st, but some few 4—5 mm specimens, found in the beginning of June show that the spawning, according to the observations of Schmidt, continue until the beginning of May.

The present collections of Faroe coalfish fry from the spring thus indicate that the spawning of the coalfish begins in February, culminates about April 1st and ends in the beginning of May.

II. Distribution of the Pelagic Fry in the Faroe Area.

In the Faroe waters the tidal currents are extraordinarily strong. The rising tide causes currents directed to the N.W. between the islands. These currents are complicated by counter currents near the coast, the so called "Ider", which, at the turn of the tide, spread over the

whole fjord and form the main current, while new "Ider" in the other direction rise along the shore. The force of the current varies in accordance with the periods of the moon, and reach of course the greatest velocities in the narrow sounds, but even off the open coasts speeds of 3—4 knots may occur. The tidal currents constantly mix the waters, causing nearly the same temperature and salinity from bottom to surface in the fjords and on the coastal banks. Like Iceland, the islands are surrounded by an anticyclonic drift, the time of circulation being nearly one month, according to Taite (1930 p. 32). Towards the edge of the shelf, the speed of the tidal currents decreases, and the waters surrounding the Faroes are on the whole rather stationary and change but slowly by rise of bottom water from the surrounding depths.

Owing to these current conditions we must suppose that eggs or fry from any locality off the Faroes in a few weeks may be carried to almost any other place within the area. Drift-bottle experiments confirm this supposition, as bottles are found again on the opposite side of the islands a few days after being put out. From the distribution of the number per haul and the average size of the coalfish fry from each of the numerous stations in the Faroe area, investigated in April and May, no information can therefore be derived as to whether spawning takes place all over the coastal banks on suitable depths or whether the coalfish gather on one or more restricted spawning places. This question, like that regarding the exact time of spawning, can only be solved by making collections of eggs or spawning coalfish in the first months of the year.

Fig. 3 shows the distribution of the pelagic fry in 1934 and 1935. In 1934 two hauls of 15 minutes by the 2 m ring trawl were carried out at each station, one with 10 or 15 m wire, one with 40 or 65 m wire. The sizes of the circles are proportionate to the total number of coalfish from these hauls. In 1935, and on a few occasions in 1934, only one haul per station was made, and for the sake of comparison the circles indicating these stations show twice the number caught. It is seen that the fry is found all over the coastal banks, in the sounds between the islands, and in the deeper parts of the fjords, but pelagic coalfish fry is absent from the inner parts of the fjords, where the tide causes no marked mixing of the waters. The same is the case in the narrow parts of the sound between Strømø and Vaagø. In Skaale Fjord pelagic stages were never found, in spite of numerous investigations. This is undoubtly due to the fact that the threshold in the mouth of the fjord hinders the entrance of water from outside.

Outside the coastal banks over the great depths the coalfish fry is only found scattered in very small numbers, as earlier reported by Schmidt (1909 p. 36).

The investigations at the end of March and the beginning of April 1935 were carried out from a small motor cutter, and were therefore chiefly confined to the coastal waters. The fry was already distributed all over the region (fig. 3*A*). On stations investigated outside the 100 m line an average of 169 specimens per one hour haul was found, while inside the 100 m line an average of 74 specimens was caught per hour, or 89 per hour if the stations where no pelagic fry was found are excluded. The fry was thus generally most numerous over the depths where the spawning is supposed to take place, but the numbers per haul vary very much from one station to another. Thus the highest number, viz. 125 specimens, was caught in a 15 minutes haul in the northern outlet of Harald Sound, far inside the 100 m line. Table 2*a* shows the percentage length composition of the fry caught at this season outside and inside the 100 m line. A little more than half the individuals in both collections measures from 4 to 6 mm. On the stations inside the 100 m line, however, the percentage of newly hatched larvae is smaller than outside, the average length inside the 100 m line being 5,6 mm, outside 5,0 mm.

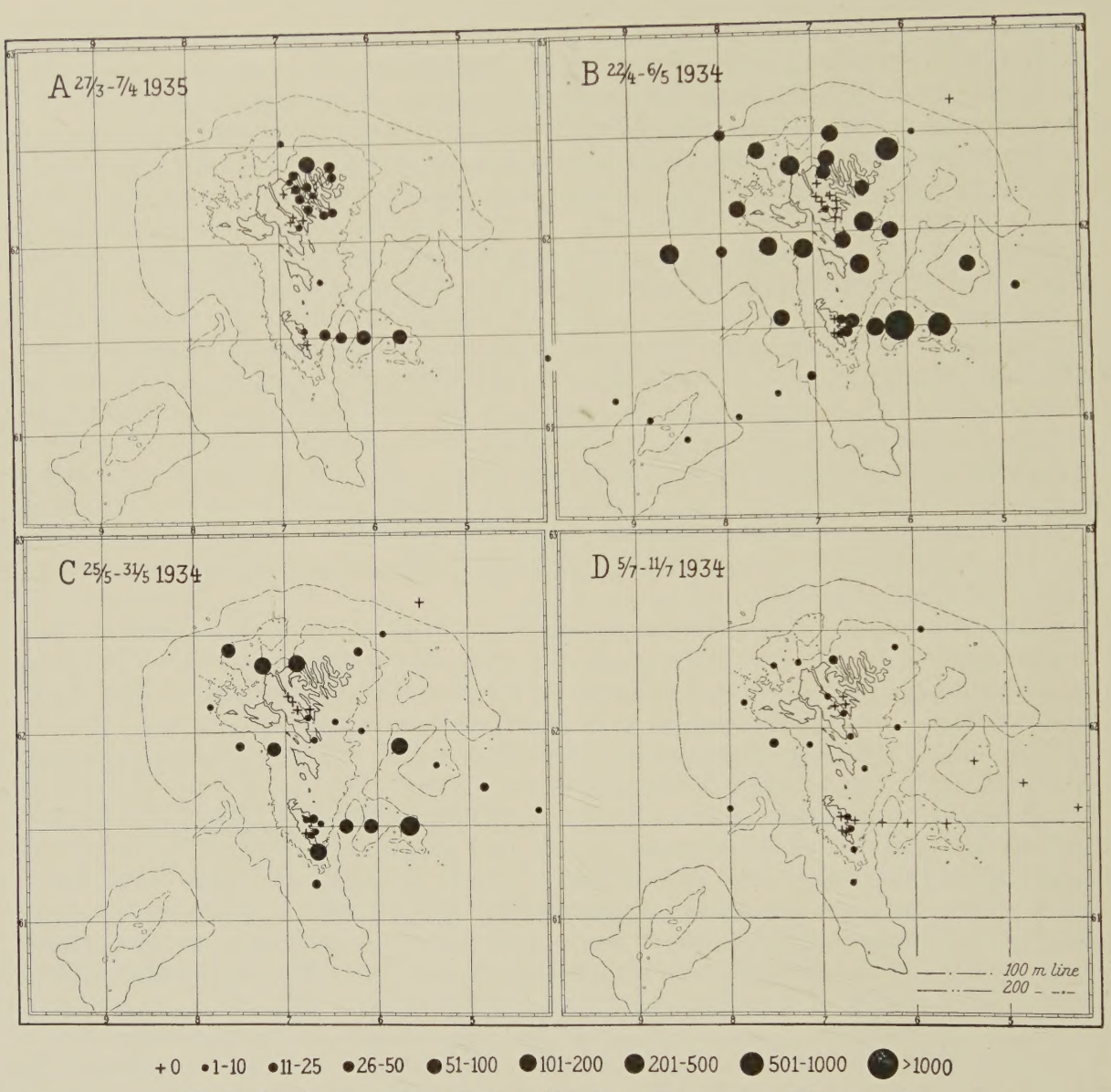

Fig. 3. Distribution of the pelagic coalfish fry in Faroe waters 1934 and 1935.
The circles denote the total number in two S. 200 hauls of 15 minute each. +: no fry.

From April 22nd to May 6th 1934, or one month later in the year, pelagic stages in the samples were very numerous (fig. 3*B*). On many stations several hundreds were caught, and on Suderø Bank the specimens in two hauls of 15 minutes each amounted to 1044. At this time too the fry, on the average, was most frequent on stations outside the 100 m line, the average here being 444 specimens per one hour haul and excluding the stations at the bottom of the fjords, 287 specimens per hour. Relatively the difference in the averages is somewhat smaller than in March—April 1935. The length composition (table 2*b*) is about the same outside and inside the 100 m line, the average length of the fry being 8,9 and 8,8 mm, but the

Table 2.

Percentage length frequency and number per haul of pelagic young coalfish caught outside and inside the 100 meter line.

	a		*b*		*c*		*d*[1])	
Date	$^{27}/_{3}$—$^{7}/_{4}$ 1935		$^{22}/_{4}$—$^{6}/_{5}$ 1934		$^{25}/_{5}$—$^{31}/_{5}$ 1934		$^{5}/_{7}$—$^{11}/_{7}$ 1934	
Localities in proportion to 100 m line	outside	inside	outside	inside	outside	inside	outside	inside
mm	‰	‰	‰	‰	‰	‰	‰	‰
35	..	..	..	..	..	..		
34	..	..	..	..	..	..		
33	..	..	..	..	..	..		
32	..	..	..	..	..	..	91	27
31	..	..	..	..	..	..		
30	..	..	..	..	..	..		
29	..	..	..	..	..	..		
28	..	..	..	..	..	..		
27	..	..	..	..	..	..	91	216
26	..	..	..	<1	2	..		
25	..	..	..	..	..	..		
24	..	..	..	..	..	4		
23	..	..	..	..	..	5		
22	..	..	..	..	2	5	121	297
21	..	..	..	..	..	2		
20	..	..	..	..	3	14		
19	..	..	..	..	2	12		
18	..	..	<1	1	5	14		
17	..	..	<1	1	9	19	303	324
16	..	..	1	1	10	27		
15	..	..	2	3	24	27		
14	..	..	4	7	33	32		
13	..	..	15	16	43	63		
12	..	..	31	33	91	74	364	108
11	..	..	73	56	190	145		
10	..	11	134	100	222	182		
9	..	14	204	169	195	183		
8	6	36	230	236	133	146		
7	36	97	154	109	33	46	30	27
6	154	151	87	27	3	..		
5	254	289	46	3	..	..		
4	284	294	17	..	..	..		
3	266	108	2	..	..	..		
2	..	..	..	..	..	..	..	..
1	..	..	..	..	..	..		
0	..	..	..	..	..	..		
No. of specimens	169	443	3777	2154	580	567	33	37
Average No. per hour	169	74	444	180	89	65	4	4
Average length in mm	**5,0**	**5,6**	**8,9**	**8,8**	**10,9**	**11,5**	**18,1**	**21,0**

[1]) Owing to the small number of specimens in this sample the measurements were grouped in 5 mm classes when calculating the percentage frequency.

smallest larvae, of less than 6 mm in length, were a little more numerous outside the 100 m line, their total percentage of the material being, however, only 6,5 %.

At the end of May 1934 (fig. 3*C*) pelagic stages still occurred in numbers all over the area, but the average per haul was considerably lower than in the beginning of the month, more than 100 being caught only on a few stations. The highest number in two 15 minutes hauls, viz. 234 specimens, was caught on Suderø Bank. Outside the 100 m line 89 specimens per one hour haul were found and inside 65, or excluding the negative stations at the bottom of the fjords 84 specimens per hour. The average number per haul in all the samples was nearly 30 % of the corresponding number from April 22nd to May 6th of the same year. In the numerous hauls carried out with the seine in the fjords only very few coalfish of the 0-group are found before the 1st of June. The great reduction of the pelagic stock is thus only to a small extent due to the immigration to the shallow water in the littoral region; the main cause being perhaps that the pelagic coalfish fry represents a very important food for different birds and fish, but most likely the reduction of the average number per haul is also to some degree due to other causes. The average length of the young coalfish collected had risen to 11,1 mm, i. e. only a little more than 3 mm in about a month. We may suppose that the coalfish fry in the transition between the proper pelagic stage and the stages found in shallow water in the littoral region, lives half pelagic close to the coast, where ring trawl or eel hand seine are quite or partly inefficient because of skerries and current. The fry has drawn a little nearer to the coast, as the frequency was about the same outside and inside the 100 m line. The length composition shows (table 2*c*) a somewhat higher percentage of the largest young coalfish in the material collected inside the 100 m line, the average length is therefore somewhat greater than outside i. e. respectively 11,5 and 10,9 mm.

Another possible reason for the reduction in number per haul and the apparently too low average size, is that many of the largest specimens are now so active as to be able to avoid the ringtrawl, which is moved but slowly through the water. Also the rapidly increasing intensity of light in these months may make it more easy for the fry to avoid the gear. Finally we may suppose that the stock is slightly diminished by the drift away from the area, as further discussed below.

In 1926 pelagic fry was collected from 22nd May to 9th June. Excepting two stations outside the 200 m line all investigations were carried out inside the 100 m line, and generally entirely inside the fjords. A total of 816 specimens, averaging 62 per hour was found here, i. e. about the same number per haul as at the end of May 1934. But the material cannot be compared directly with the samples from 1934, as the year classes no doubt vary considerably. The length of the fry ranged from 6 to 35 mm with an average of about 15 mm, and is thus somewhat larger than at corresponding stations in the end of May 1934. The immigration to the fjords was apparently further advanced, thus pelagic fry was found on several station in the fjords, for instance on the inner stations in Trangisvaag and Vaag Fjord on May the 31st and June 1st respectively 11 specimens from 19 to 31 mm (average 25 mm) and 22 from 23 to 35 mm (average 28 mm). At the same time the first young coalfish appeared in the seine hauls from the littoral region of these fjords.

From June adequate collections with ring trawl on the banks are missing. The seine hauls in the fjords, however, show that the greater part of the fry goes inshore in this month. In the beginning of July 1934 (fig. 3*D*) young coalfish were therefore very scarce in the ring trawl hauls, maximally 23 specimens in two hauls of 15 minutes were caught on a station to the north of the islands, and they were absent on some stations. On an average about 4

individuals per one hour haul were found, both inside and outside the 100 m line. The length varied from 9 to 34 mm, specimens more than 20 mm long forming a little more than half the catch inside the 100 m line and nearly a third outside (table 2*d*), Inside the 100 m line the average length was 21,0 mm and outside 18,1 mm.

Later than the 11th of July coalfish fry has not been observed outside the fjords. A few young specimens were caught pelagically in Vaag Fjord in the beginning of August, they measured 28 to 31 mm and must no doubt be reckoned as small littoral stages which accidentally reached the greater depths in search of food.

So far as sufficient material was available it proved that in all localities the average size of the fry which occurs in small numbers near the shelf of the coastal banks is somewhat higher than on the banks proper. This shows that, to a small extent, a drift of fry takes place as some of the surface water on the banks slowly moves towards the periphery of the driftcircle and mixes with the surrounding oceanic water.

So far only the material collected between the islands and on the coastal banks proper has been taken into account. In comparison the collections from the Faroe Bank and the water outside the banks are rather scattered and few, but if we combine all pelagic stations in this area investigated by the Danish research vessels the distribution of the coalfish is quite clearly represented. Fig. 4 shows these stations for the month of April, May, June and July. Collections carried out later in the year contain no fry at all.

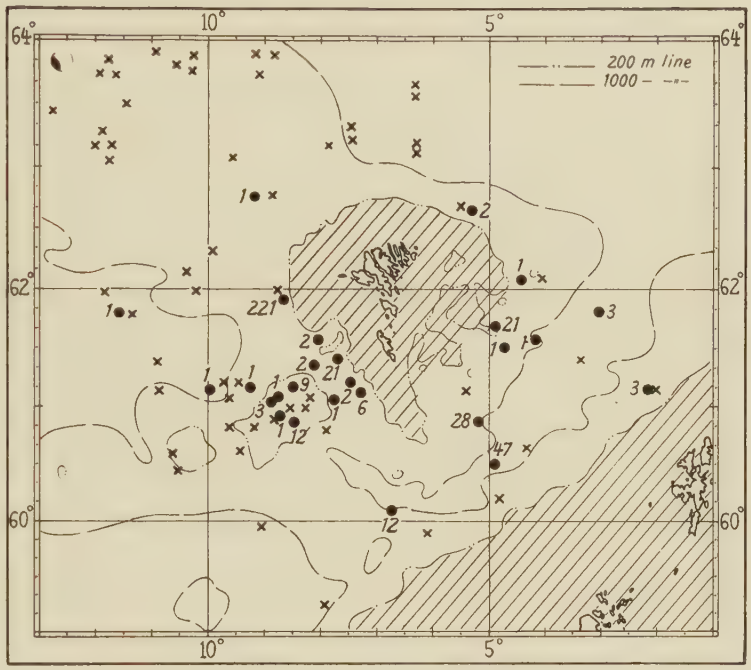

Fig. 4. Distribution of the coalfish fry outside the 200 meter line in the waters surrounding the Faroes.
All stations from April, May, June and July during 1903 to 1939 with statement of total number caught on each station. ×: no fry. Hatched: the coastal banks where the fry is common.

In the middle of April 1904 Schmidt (according to the journal of the cruise) found a few pelagic larvae on Faroe Bank and discovered by hatching that the numerous fish eggs caught over the bank were partly eggs of coalfish. It is very unlikely that these eggs had drifted from the coastal banks of the Faroes or the British Isles, and thus it must be regarded as proved that the coalfish spawns on this isolated bank. The minimum depth on the Faroe Bank is about 100 m, and it is doubtful if the coalfish is able to live here in its first bottom stages as, in all cases so far known, it grows up only in shallow water near the coast. Possibly only such larvae as drift towards the coastal banks in the pelagic state will develop. Drift bottle experiments have shown that such a drift from the Faroe Bank towards the islands is possible, as a bottle thrown out on the Faroe Bank was refound 28 days later in Vaag Fjord.

According to Ove Paulsen (1911 p. 238 & 1918 p. 27) the plankton over the Faroe Bank differs from plankton in the surrounding water in being richer and more neritic, and this implies that the water over the bank does not change particularly quickly, as in that case such a difference could hardly be distinguished. However, the size of many of the young coalfish caught on the bank indicates that they have certainly lived pelagically for 2—3 months. Even if the anticyclonic water movement, which to a certain degree surrounds the bank, hinders a drift away from it, it is hardly possible that the mass of water is so stationary that the pelagic fry stay in this little area for several months. As shown on the current chart (fig. 5) and as appears from the observations of Schmidt on the distribution of *Salpa fusiformis* in the spring and summer of 1905 (Schmidt 1909 p. 159) a drift of fry from the banks along the western coast of the British Isles to the water west of the Faroes is rather likely, while a drift from the Faroes to Faroe Bank on the contrary is hardly possible.

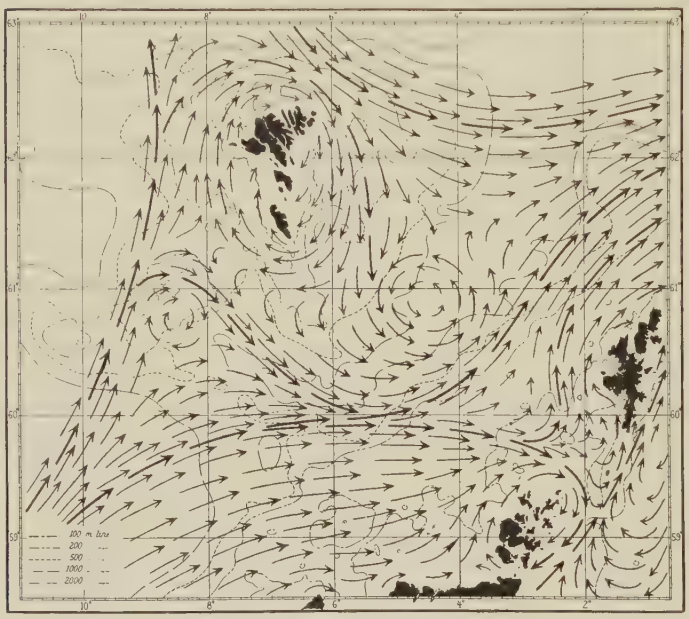

Fig. 5. The surface-currents surrounding the Faroes. (After Taite 1937).

The coalfish fry has been found only in very small numbers on Faroe Bank (fig. 4) the total being only 26 specimens inside the 200 m line. On May 11th 1904 9 individuals were caught in the course of 50 minutes and 2 per one hour haul was the average in April, May and June. Later than the end of June fry has not been observed on the bank.

It is interesting to note that the length of most of the specimens is considerably higher than the average length of fry in contemporary samples from the coastal banks of the Faroes. On the Faroe Bank, for example at the beginning of May 1934, a total of 6 pelagic stages were caught, of which 3 were 24 to 27 mm long, the average length for the rest of the Faroe region at the same time being 8,8 mm. A total of nearly six thousand young individuals were collected in the latter region from the 22nd of April to 5th of May, among which a single specimen measured 26 mm while all others were less than 19 mm and hardly 1 % exceeded 14 mm (see table 2*b*). This conspicuous difference in size of the fry from the Faroe Bank and from the coastal banks is undoubtly due to the fact that the former comes from localities with higher temperature, and accordingly earlier spawning, and most likely a higher rate of growth. Possibly they were spawned on the Faroe Bank, where the temperature in the spring is somewhat higher than on the coastal banks of the Faroes, but more probably they have drifted from the banks off the western coast of the British Isles, as mentioned above. It may even be assumed that the young individual of 26 mm found near the islands has drifted from the Faroe Bank or from British spawning places.

On the stations between the coastal banks and the Faroe Bank the occurrence of fry is likewise rare; these young most certainly originate partly from the Faroe Bank and more

distant spawning regions and partly, in the case of the inner stations, from the Faroe area proper. Some few young coalfish were collected west of the Faroe Bank, but the species is absent from the majority of samples here. In 1905 SCHMIDT found an individual of about 20 mm in 61°50′ N. 11°38′ W. i. e. nearly midway between the Faroes and Iceland, and assumes therefrom that, to a small degree, a drift of fry takes place from the S.W. part of the Faroes area toward the N.W., not excluding the possibility that the specimen in question originated from spawning on one of the banks S.W. of the area (SCHMIDT 1909 p. 36). On most of these banks, Bill Bailey's Bank, Lousy Bank (or Outer Bailey Bank) and Rockall Bank, grown up coalfish have been found, while eggs or fry only have been observed on Rockall Bank, where a single pelagic individual was caught by SCHMIDT (1909 p. 222) towards the end of May 1908. As the pelagic investigations covering these localities are rather few, it may at the same time be possible that spawning on a small scale occurs here, since the depth, the temperature and salinity are all suitable.

North of the Faroes coalfish fry is extremely rare. The only specimen caught here, far beyond the 100 m line, about 60 nautical miles N.W. of the islands, hardly originated from the coastal banks; most likely it has drifted from the Faroe Bank or the more south western regions. North of the submarine ridge connecting the Faroes and Iceland, where the current goes S.E., coalfish fry, as would be expected, has never been observed.

Finally the chart shows that the fry has been collected in rather small quantities beyond the 200 m line in the Faroe—Shetland Channel. In this area a total of 16 stations has been examined; on 9 stations coalfish fry was caught, in all 130 individuals. One of the stations is near Suderø Bank, and the 34 specimens caught here in April and May no doubt belong to the stock of the coastal banks. Nearly all the remaining individuals were caught over depths ranging from 500 to 1000 m. As shown on the current chart (fig. 5) south easterly drift runs both from the Faroe Bank and from the eastern portion of the Faroe area to join the surface drift off the western coast of the British Isles, which is directed N.E. Most likely therefore, the fry living in the area between the Faroes and Shetlands includes individuals both from the spawning grounds at the Faroes and on Faroe Bank, and from the spawning places off the western coast of the British Isles. About halfway across the Channel an eddy is formed, and this is possibly the reason why the coalfish fry here has been found more abundantly. From the Faroe—Shetland Channel the fry probably is carried to the banks of the Shetland Islands, partly northward to the northern portion of the North Sea and partly towards the coast of Norway. Several times driftbottles thrown out between the Faroes and Shetland Islands have been recovered on the coast of Norway after nearly 2 months, and it is possible that a few young specimens are able to reach Norway during the pelagic stage, which normally lasts 3 months.

Further it is possible that the young coalfish continue living pelagically longer than normally when they have been carried away from the banks. While pelagic specimens more than 25 mm long were very rare on the coastal banks, they form a fairly high percentage of the fry living further outside. The largest pelagic individual in the material at hand was caught in July on a station near the eastern boundary of the Faroe—Shetland Channel. It measures 43 mm, a length far beyond the normal size at immigration, which is between 25 and 35 mm.

III. Vertical Distribution of the Pelagic Fry.

The present collections of coalfish fry have mainly been collected in ring trawl hauls in the uppermost layers of the water. In only a few cases a wire length of more than 65 m has been used. These few deeper hauls were carried out on dates or stations where the fry was

scarce, and the few specimens thus collected may have been caught at the surface when the gear was hauled in, and they do not invite to speculations as to vertical extension of the pelagic fry in the area dealt with. In any case we may take it as granted that the majority of the coalfish fry lives in the uppermost layers, which are fished with lengths of wire ranging from 10 to 65 m.

Schmidt writes about the coalfish fry in the northern Atlantic that "the rule is that the youngest pelagic stages are found nearest the surface, the older somewhat lower down. Yet relatively large fry of the coalfish (about 2—3 mm long) may appear in quantities right on the surface, as I have several times observed at Iceland" (Schmidt 1909 p. 32). On all stations two ring trawls were used simultaneously, one with 15 and one with 65 m wire or sometimes wire lengths of 10 and 40 m. What depths are actually trawled with such lengths of wire we cannot say with accuracy. The speed of the ship is adjusted to keep the uppermost ring trawl right under the surface, while the deeper one would fish in depths from 10 to 30 m, depending on the speed of the ship, current etc.

For the investigations in March and April 1935 only one haul was made on each station, and from this time of the year data of the vertical distribution of the fry are therefore missing.

From the collections in April and May 1934 and May to June 1926 considerable data are available from simultaneous hauls at the surface (i. e. with 10 or 15 m wire) and somewhat deeper with 40 or 65 m wire. These were compared in order to ascertain, if there is a difference in number and size between the fry from the surface and the lower layers. The number in two such simultaneous hauls are often very different, sometimes one contains 4 to 5 times as many specimens as the other, but which is the bigger haul seems to be a matter of chance.

At the foot of table 3 is shown for each period the number of specimens caught with 10 or 15 m wire and with 40 or 65 m wire, the total number of stations, the number of stations on which the fry was more frequent in the surface hauls and the number of stations showing the reverse condition. In 37 of the 75 stations the fry was found to be most numerous in the deeper hauls and 4 stations showed equal quantities. A total of nearly 8000 young specimens was collected, of which 54 % were near the surface. Examining each period separately, it is found that at the surface the number is now the bigger now the reverse. Thus in April—May on most of the stations the fry were more numerous in the deeper hauls, but, when all the stations are taken into consideration, the greatest total number was caught at the surface. In spite of the great variation of single stations, the material shows distinctly that the coalfish fry occurs just as frequently near the surface as in layers of water somewhat deeper down (the layers of about 10—30 m depth).

If we now compare the composition as to size nearly the same result is attained, fairly large differences are often found, but the number of stations at the surface in which the average size of the fry exceeds that of the hauls a little deeper down is almost equal to the number of stations showing the reverse. Table 3 also shows the length composition of the three collections of which the composition in numbers has been recorded above. In both collections from 1934 the length frequency of the fry caught in hauls of 10 or 15 m wire and of 40 or 65 m wire are nearly identical. The average length in the hauls in the surface from April 22nd to May 6th was 8,9 mm, and in the deeper hauls 8,8 mm. At the end of May the corresponding values were 11,2 and 11,3 mm, the material from May 21st to June 9th 1926 is far smaller than the two others, and was collected at more irregular intervals; consequently the size distribution is very irregular. The frequency of the individuals more than 15 mm long is nearly alike, but in hauls with 40 or 65 m wire smaller specimens are a little more abundant than near the

Table 3.

Length of pelagic young coalfish caught in simultaneous hauls in different depths.

Date	$^{22}/_{4}$—$^{6}/_{5}$ 1934		$^{25}/_{5}$—$^{31}/_{5}$ 1934		$^{21}/_{5}$—$^{9}/_{6}$ 1926	
Meters of wire	40—65	10—15	65	15	40—65	10—15
mm						
32	..	..	..	..	1	..
31	..	..	..	..	1	..
30	..	..	..	..	..	..
29	..	..	..	..	1	1
28	..	..	..	..	1	1
27	1	..	..	..	1	3
26	1	..	1	..	1	..
25	..	1	..	..	4	..
24	1	..	..	2	2	5
23	..	..	1	2	9	5
22	..	..	2	2	13	9
21	..	..	1	..	23	7
20	..	..	2	7	19	12
19	..	..	2	6	21	19
18	..	2	4	7	20	16
17	1	3	5	11	16	19
16	1	4	9	12	11	17
15	7	7	16	13	13	12
14	13	19	20	19	12	17
13	38	54	25	36	19	15
12	77	114	48	47	31	16
11	157	242	85	107	39	18
10	307	415	101	129	41	18
9	487	648	84	132	41	23
8	644	731	62	100	35	15
7	550	541	17	29	10	7
6	274	292	..	2	..	2
5	101	131	..	..	..	..
4	22	48	..	..	..	..
3	3	5	..	..	..	..
2	..	..	..	..	..	..
1	..	..	..	..	..	..
0	..	..	..	..	..	..
Number of specimens	2685	3257	485	663	385	257
Number of stations (Total 75)	36		25		14	
No. of stations on which the fry was more frequent at the respective depth	20	15	9	13	8	6
Average length in mm	**8,8**	**8,9**	**11,3**	**11,2**	**14,6**	**15,6**

surface so that the average length is greatest near the surface, i. e. 15,6 mm, while the average length of specimens from the deeper hauls is 14,6 mm. These differences, which disagree with the rule laid down by SCHMIDT, surely must be accidental and might disappear if the material were more adequate.

Table 3 plainly shows that in the area of the Faroes smaller larvae are not more numerous near the surface than are the larger. The strong vertical mixing characteristic of the Faroe waters surely accounts for this deviation from the rule laid down by Schmidt.

The vertical distribution assigned by Schmidt must be due to the fact that the different sizes of pelagic larvae, or their food, either seek different intensities of light, temperatures or salinities, or have different specific gravity. If the higher intensity of light near the surface in other areas causes larger young individuals to go deeper down than do the smaller, the deviations of the rule at the Faroes would be owing to the fact that the strong vertical movements in the waters of the Faroes directly prevent such a distribution, of the fry or their food. Owing to this mixing of water, temperature and salinity are nearly the same from surface to the bottom in the Faroes during the season when the larvae are present. If these factors, or increase of specific gravity during growth, determine the vertical distribution of the fry it is easily understood that no constant difference was observed between size and number of larvae in the hauls from different depths.

In order to find out from the simultaneous hauls from the surface and deeper layers if the varying differences in number and composition are caused by diurnal and nocturnal vertical migrations, arrangements of all samples according to the hour at which they were taken was tried, but no ostensible differences in the distribution by day or night were found. Stations where the fry were most numerous at the surface, or vice versa, appeared quite casually day or night as differences in size varied, independently of the hour, in samples from the surface and deeper layers of the water. Thus no investigations from the Faroe area denote that the coalfish fry undertakes extensive vertical day and night migrations. Such migrations also hardly could be expected, as at this time of the year the night is very short and bright in these latitudes. It is more likely that the uneven distribution of the pelagic young in the hauls is caused either by the current or is due to the fact that the coalfish fry concentrates in shoals rather early.

IV. Immigration of the Fry into the Fjords.

Later in the summer coalfish of the 0-group are found in shallow water all along the shores of the Faroe fjords. Here, in collections with the seine, the coalfish fry nearly always furnish the greatest portion of the total catch. The numbers per haul are often very large, thus in two hauls in Vaag Fjord on August 10th 1912, 2735 young of the first age group were caught, besides some few older specimens. This abundance may be due to the fact that the spawning grounds are very large in proportion to the extent of the shore, where the fry grows up.

As will be discussed later, the young coalfish do not quite give up the pelagic mode of living after the immigration from the offshore waters to the littoral region. Accordingly, the generally used designation "bottom stages" is somewhat misleading, and in the following the young coalfish will be termed "littoral stages" in the period of life they spend in the littoral region.

In 1904 Schmidt found the first littoral stages in Vestmanhavn on May 21st. In spite of rather numerous investigations with seines carried out later in the Faroe fjords during April and May, this date has not been altered for the earliest occurrence of the fry in the littoral region. Table 4 gives a summary of all collections with eel hand seine in the Faroe fjords carried out up to 1939 during the months of May and June. In all hauls earlier in the year the 0-group

Table 4.

All eel hand seine collections from May and June with statement of year, number of hauls (in brackets) and total number of 0-group coalfish caught (heavy types).

Date	Vaag Fjord	Trangisvaag Fjord	Vestmanhavn	Thorshavn	Skaale Fjord	Kollefjord	Kvalvig	Suðuroy	Funding Fjord	Total
1/5—5/5	1934 (12) **0**	1934 (9) **0**	..	..	..	..	..	..	..	(21) **0**
6/5—10/5	1910 (7) **0**	..	..	..	..	..	..	..	..	(7) **0**
11/5—15/5	..	1904 (5) **0** 1912 (3) **0**	..	1912 (5) **0**	..	..	..	..	..	(13) **0**
16/5—20/5	1904 (8) **0**	1913 (3) **0**	..	..	1925 (2) **0**	1925 (4) **0**	..	..	..	(17) **0**
21/5—25/5	1924 (6) **18** 1925 (7) **0**	..	1904 (2) **7**	..	..	..	..	1925 (6) **0**	..	(21) **25**
26/5—31/5	1934 (9) **2**	1913 (6) **0** 1924 (3) **19** 1926 (5) **23**	1924 (2) **89**	..	1926 (5) **0**	1924 (4) **0** 1926 (3) **0**	1926 (4) **0**	1924 (7) **2**	..	(48) **135**
1/6—5/6	1926 (23) **56**	1913 (7) **6**	1912 (1) **0**	..	..	..	..	..	..	(31) **62**
6/6—10/6	..	..	..	..	..	..	..	..	..	..
11/6—15/6	1932 (18) **7170**	..	1912 (1) **0**	..	..	..	..	..	..	(19) **7170**
16/6—20/6	1913 (3) **0** 1932 (8) **9** 1927 (26) **110**	..	..	..	..	..	..	..	..	(37) **119**
21/6—25/6	..	..	..	1913 (3) **34**	1932 (15) **21**	..	..	1932 (4) **1877**	1932 (3) **22**	(25) **1954**
26/6—30/6	..	..	..	..	1927 (15) **0**	1927 (10) **0**	..	..	..	(25) **0**

coalfish is missing, while later in the year, with a single uncertain exception, it has been taken in great quantities. The table includes collections from 10 different years, in 5 of which i. e. the years 1904, 1913, 1924, 1926 and 1934, the first bottom stages were caught from May 21st to June 2nd. Only in two of the remaining years the fry is still missing from hauls after this period. From one of the years, i. e. 1912, only two hauls were taken, both in the first half of June, in Vestmanhavn. However, the earliest catches of bottom stages contain so few individuals per haul that from a few negative collections it cannot be deduced that the fry is absent. The negative hauls from the end of June in 1927 were carried out in Skaale Fjord and Kollefjord where special conditions prevail. Thus it must be considered as a rule that the first littoral stages of the coalfish occur in shallow water in the Faroe fjords about the 1st of June.

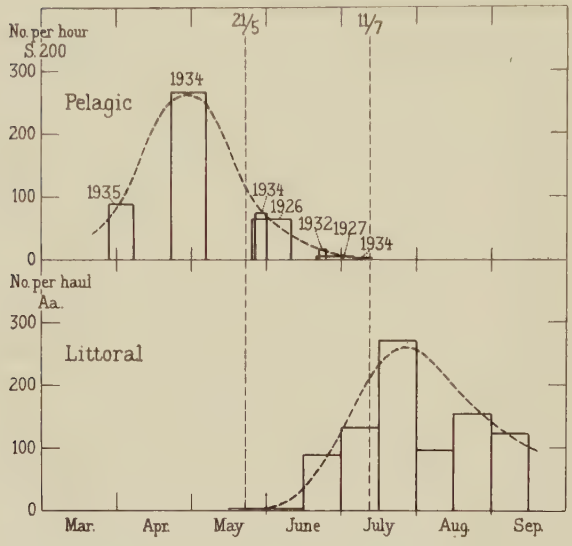

Fig. 6. Decrease in number of pelagic coalfish fry and increase in number of littoral stages of the 0-group in spring and summer. Upper diagram: average number per one hour haul with 2 m ring trawl in the periods investigated. Breadth of the columns: Duration of investigation. Lower diagram: Average number per haul from all eel hand seine collections during 1903 to 1939 classed halfmonthly. $^{21}/_{5}$: the earlist observation of littoral stages. $^{11}/_{7}$: the latest observation of pelagic stages.

As formerly mentioned pelagic coalfish fry has not been observed in the Faroes later than the 11th of July. Pelagic collections have been carried out later in July in the years 1933, 1934 and 1939 and in all of them coalfish were absent. From the end of June and the beginning of July in 1927, 1932 and 1934 pelagic coalfish fry is found in small quantities in all the hauls taken. Thus as a rule it appears that the last coalfish young give up the off shore pelagic life before the middle of July.

The largest pelagic fry caught at the Faroes were 35 mm long, and sizes exceeding 30 mm are fairly rare. The smallest specimen in the eel hand seine collections was 22 mm, and sizes less than 25 mm are extremely rare; thus the normal size of immigration must lie between 25 and 35 mm. The size of the earliest bottom stages caught varied from 25 to 50 mm. During this period a little more than 50 % of the specimens were between 25 and 35 mm.

Comparison of the diagrams fig. 6 gives a somewhat more exact picture of the immigration. The upper diagram gives the average number of pelagic young calculated for one hour hauls with 2 m ring trawl in the years where an adequate number of samples was collected in the spring. As annual fluctuations in the quantity of the fry no doubt take place, the quantities (the height of the columns) in periods from the same year (i. e. 1934) alone can be compared directly; but the averages for periods investigated in other years agree well with the values found in 1934.

The lower diagram fig. 6 shows the average number of young coalfish per seine haul in the Faroe fjords. The height of the columns gives the average for all hauls which were carried out in each half monthly period. In spite of the fact that the collections are dispersed over many years, and include a great number of hauls, the diagram shows considerable discre-

pancies from different causes; it must therefore be considered as giving merely a rough aspect of the conditions.

From the end of May to the beginning of June the diagrams overlap; so this must evidently be the period of immigration; we note, however, that the highest increase in quantity per seine haul, and the sharpest drop in number of pelagic fry, do not set in simultaneously; the former commences a little later. In the same way the quantitative culmination of the bottom stages does not set in until the last half of July, although very few pelagic specimens were caught in the first half of this month. Possibly this displacement is only a casual irregularity in the diagram, and may be it would disappear if the material were sufficiently extensive and uniform, but some other reason may also be imagined.

It is supposed that the efficiency of the ring trawl is smaller in collecting the larger and most active pelagic young fish, and it is also likely that a certain proportion of the smaller bottom stages escape through the meshes of the seine. No doubt the errors due to these causes conduce to the displacement of the diagrams.

It can hardly be doubted that the migration takes place normally in the uppermost layers of the water. It is not very probable that the fry spawned on the far off-shore banks, for instance the Faroe Bank, seek the bottom and grow up in these places. We must suppose that the fry, having reached the size for immigration, actively seeks the coast by swimming. The proved difference in size of the fry inside and outside the 100 m line at the end of the pelagic period can hardly be understood otherwise; the same comes out still more distinctly from table 5 showing the length composition of the fry in Vaag and Trangisvaag Fjords and at Vestmanhavn at the time when the first littoral stages appear. It will be seen that the fry in the inner parts of the fjords is considerably larger than at stations at the mouths of the fjords, and approach the size of the littoral stages caught in the seine in the innermost parts of the fjords. However, the strong tidal currents must strongly affect this immigration. When the fry reach the coasts, more or less by help of current, in many cases the coastal currents ("Ider") will carry them further on until they have the opportunity to seek the more quiet waters of the inlets and fjord bottoms. In the coastal currents close to land, where neither eel hand seine nor ring trawl has been used, the temporary sojourn of the fry would possibly be a contributing reason why the fry partly disappears from the ring trawl collections before it is caught at the coasts. It would also explain why the number per seine haul does not culminate till some time after the last pelagic stages have been observed.

As shown in table 4, all the earliest catches of the bottom stages are from Vaag, Trangisvaag and Vestmanhavn with a single exception. Naturally this is partly due to the fact that a specially large number of investigations have been carried out in these fjords, but from the last week of May the total of 16 negative hauls in Skaale Fjord, Kollefjord and Kvalvig shows that the fry immigrates later here than in the fjords before mentioned, where specimens are found at the same date and also earlier in the same year. The reason is certainly that Vestmanhavn, Vaag and Trangisvaag Fjord are rather open fjords near the outer coast, while the localities investigated in Skaale Fjord, Kollefjord and Kvalvig lie far inside the narrow fjords between Strømø and Østerø. However, the two small littoral stages caught in 7 hauls in Fuglefjord on the May 30th 1934 show that quite a few bottom stages are able to reach the inner fjords at the end of May.

If we examine the length composition of the littoral stages it may sometimes be noticed that the frequency curve for the 0-group individuals caught at the same time and in the same locality, in some cases is bimodal or multimodal. Fig. 7 is an instance of such a case. The very great number of specimens was caught in a total of 18 hauls in the inner part of Vaag Fjord,

Table 5.

Length of pelagic and littoral stages of coalfish in simultaneous collections from different parts of a fjord in the beginning of the period of immigration.

Locality	Vaag Fjord			Vaag Fjord			Trangisvaag Fjord			Trangisv. Fj.		Vestmanhavn		
Date	31/5—2/6 1926			23/5—26/5 1924			31/5 1926			26/5 1924		27/5—28/5 1924		
Gear	Aa.	S. 200	S. 200	Aa.	S. 200	S. 200	Aa.	S. 200	S. 200	Aa.	S. 200	Aa.	S. 200	S. 200
Part of the fjord examined	littoral	inner	outer	littoral	inner	outer	littoral	inner	outer	littoral	inner	littoral	inner	outer
No. Aa. hauls or duration of S. 200 hauls	23 hauls	15 Min.	45 Min.	1 haul	45 Min.	120 Min.	5 hauls	90 Min.	120 Min.	1 haul	60 Min.	2 hauls	15 Min.	30 Min.
mm														
50	..	..	..	..	..	..	1	..	..	..	..	..	..	..
49	..	..	..	..	..	..	..	..	..	..	..	..	..	..
48	..	..	..	..	..	..	1	..	..	..	..	..	..	..
47	..	..	..	..	..	..	..	..	..	..	..	..	..	..
46	1	..	..	..	..	..	..	..	..	..	..	..	..	..
45	3	..	..	..	..	..	1	..	..	..	..	..	..	..
44	2	..	..	..	..	..	1	..	..	..	..	..	..	..
43	4	..	..	..	..	..	2	..	..	..	..	..	..	..
42	3	..	..	..	..	..	2	..	..	..	..	..	..	..
41	4	..	..	..	..	..	..	..	..	..	..	..	..	..
40	7	..	..	..	..	..	4	..	..	..	..	..	..	..
39	9	..	..	..	..	..	1	..	..	..	..	..	..	..
38	3	..	..	..	..	..	1	..	..	..	..	..	..	..
37	3	..	..	..	..	..	2	..	..	..	..	3	..	..
36	6	..	..	..	..	..	1	..	..	..	..	6	..	..
35	3	1	..	..	..	..	5	..	..	..	..	8	..	..
34	2	..	..	..	..	..	1	..	..	1	..	14	..	..
33	3	2	..	..	1	..	..	..	..	4	..	10	..	..
32	2	..	..	1	..	..	..	..	..	1	..	9	..	..
31	1	1	..	2	..	..	..	1	..	3	..	14	..	..
30	..	2	..	5	3	..	..	1	..	7	..	9	..	..
29	..	1	..	2	4	1	..	1	..	1	..	5	1	..
28	..	1	..	4	2	..	..	2	1	..	2	4	..	..
27	..	4	..	1	1	1	..	3	..	1	1	5	..	..
26	..	2	..	..	2	1	..	2	..	..	1	1	..	..
25	..	5	1	3	3	..	..	2	2	1	..	1	1	..
24	..	2	1	..	2	1	..	3	2	..	2	..	1	..
23	..	1	1	..	2	2	..	..	1	..	3	..	..	..
22	..	..	1	..	..	..	..	2	3	..	6	..	1	1
21	..	..	..	..	1	2	..	2	4	..	4	..	1	1
20	..	..	..	..	..	1	..	2	6	..	6	..	..	..
19	..	..	1	..	..	1	..	1	6	..	2	..	..	..
18	..	..	..	..	1	1	..	1	5	..	..	..	1	1
17	..	..	..	..	..	1	..	..	9	..	..	..	..	1
16	..	..	1	..	..	..	..	1	2	..	..	..	1	3
15	..	..	1	..	..	2	..	..	..	..	..	..	1	..
14	..	..	..	..	..	..	..	..	2	..	..	..	..	..
13	..	..	..	..	..	1	..	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..	..	..	..	..	..	..	1
11	..	..	..	..	..	..	..	..	..	..	..	..	..	1
10	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..	..	..	..	1	2
8	..	..	..	..	..	1	..	..	1	..	..	..	..	1
7	..	..	..	..	..	..	..	..	1	..	1	..	..	..
6	..	..	..	..	1	..	..	..	..	..	..	..	..	1
5	..	..	..	..	..	..	..	..	..	..	..	..	..	1
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
No. of specimens	56	22	7	18	23	14	23	24	45	19	28	89	9	14
Aver. length in mm.	**39**	**28**	**21**	**29**	**26**	**21**	**40**	**25**	**19**	**31**	**22**	**33**	**20**	**14**

and the same two modes can be observed in all of them. Such curves are often interpreted as a sign that the spawning has had 2 maxima, but, in the present case, this seems not to be the cause. Unfortunately we have not an adequate number of samples of the pelagic coalfish fry from 1932, but while bimodal frequency curves are rather common in 0-group samples collected with the seine, no such case is recorded in the ring trawl collections, and just here it would be expected to find the 2 modes separated especially clearly, if the spawning accounted for this. Moreover, we do not find, as would be expected in this case, the same bimodal length distribution all over the Faroes, as it must be supposed that the pelagic eggs and young are mixed strongly by the current in these waters. Therefore, it is more likely that the immigration has taken place in two separate periods. It must be supposed that the immigration is partly dependent upon the local current conditions, which temporarily may be altered, for instance by the wind, so that immigration takes place in waves. The rate of growth (as shown in the following) rises strongly as soon as the fry reaches the belt of vegetation in the littoral region where abundant food is present. Thus the first arrived get a distinct start in growth over the fry the immigration of which is delayed.

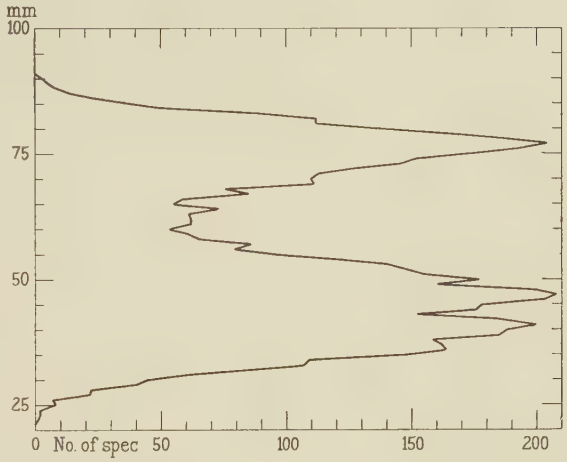

Fig. 7. Length frequency of 0-group coalfish from Vaag Fjord the 15th and 16th of June 1932. 7170 specimens caught in 18 eel hand seine hauls.

V. Reduction of the Stock in the Littoral Region and the Emigration.

As the size of the young coalfish in the different samples nearly alway classifies itself completely into age groups, the material has been analysed as to age by the Petersen measuring method, in some of the few doubtful cases, the age has been checked by scale readings. It comes out that the material consists almost entirely of the three first age groups of the coalfish i. e. as totals of about 68.600 0-group, 13.646 I-group and 787 II-group specimens. In one single case individuals from the III-group have been discovered by scale readings, and, as scale tests were only made to a small extent, possibly a few of the 787 II-group belong to the following age group. Thus the 0-group is far more numerous than the I-group in that part of the coastal zone which can be investigated with eel hand seine, and older individuals occur still more scarcely here. The reduction from 0- to I-group is considerably greater than the figures mentioned indicate, as a great proportion of the I-group has been collected in spring and the beginning of the summer, when the 0-group has not, or has but partly, immigrated to the fjords. If we exclude the material collected before the 15th of June a more correct expression for the differences is attained. Here in 590 hauls a total of about 68 thousand of the 0-group and only about 6 thousand (5892) of the I-group were caught — Thus in the course of the first year more than 90 % of the young disappear, and the following year only about one percent of the year class is left.

In fig. 8 all the material from Suderø has been grouped for each month, and the numbers per haul have been calculated separately for each age group. As the earliest investigations

have been made in the last half of April and the last in the first half of September, the material has been more practically grouped from the 16th of each month to the 15th of the next. As the coalfish fry is not equally numerous in all fjords and as these have not been investigated equally frequently and in the same periods of the year, a considerable part of these causes of error is avoided by using only the material from Suderø. This has been collected in similar localities in the neighbouring fjords of Vaag and Trangisvaag, which generally were visited at nearly the same times. The diagram therefore clearly shows how the numbers per haul decline during the years.

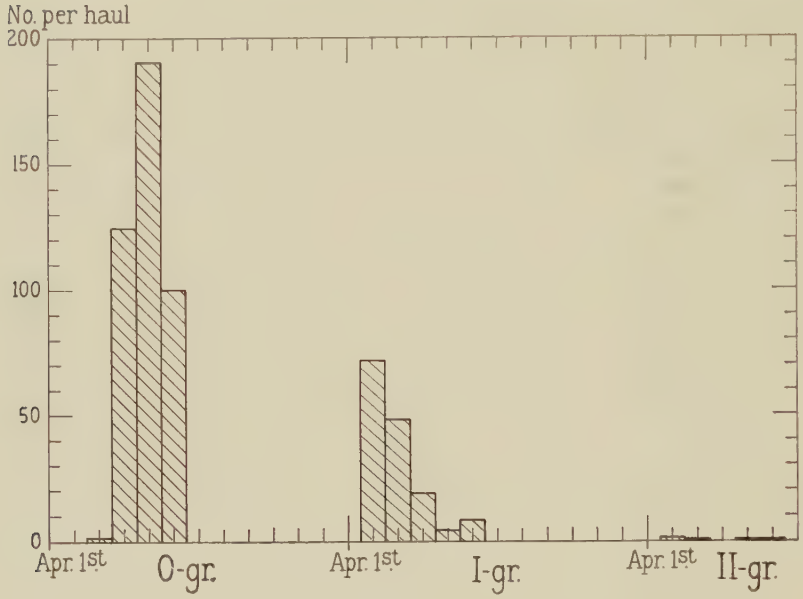

Fig. 8. Monthly average number of coalfish per haul with eel hand seine at Suderø (i. e. Vaag and Trangisvaag Fjord). All collections during 1903 to 1939.

When the immigration of pelagic fry has ceased at the end of July the year's fry of the whole Faroe area is congregated in the narrow littoral zone along the shores of the sounds and fjords, and the number per seine haul reaches its highest figures.

In the last half of July and the first part of August nearly 200 0-group specimens per haul were caught at Suderø, but as early as in the following month, the number has dropped to nearly half. This reduction is due in the first place to the violent persecution on the coalfish fry by other fish and birds. The dense shoals in shallow water furnish an easy prey to the attackers, and terns and other sea birds can be seen in quantity fishing voraciously along the shore of the fjords as soon as the fry has entered. Investigations of stomach contents show that the small coalfish constitute one of the most essential food resources for various species of fish, among others the trout and the coalfish itself, as will be referred to later.

In the following spring the number has dropped to 72 individuals per haul on an average, the stock has thus during the 6 winter months been reduced by about 25 % while the reduction accounted for nearly 50 % during the first month after the culmination,

During the second summer the numbers per haul again decline quickly, and in August and September there is less than 10 specimens per haul, and in the third summer only about one on an average of the now two year old coalfish were caught per haul. As the I-group, which is considerably larger and more active than the 0-group, would not be so easy a prey, the reduction in quantity must be owing to the fact that the majority of the coalfish as early as during the 2nd summer seeks the off shore waters. Possibly the remainder of the I-group emigrates from the littoral zone during the autumn, and may be the II- and III-group individuals caught with seine are casual wanderers from pelagic errant shoals of older fish.

In collecting the material an eel hand seine with 200 m rope on each arm was used and therefore the seine was generally put out about 150 m from the shore. As localities with slightly

sloping bottom were chosen, the majority of the hauls were carried out from 5 to 10 m depths to the shore. As hauls from different depths on the same locality are lacking, the present material does not yield any information of the distribution of the coalfish fry inside the coastal belt investigated; but according to observations from boats and piers the 0-group appears to be most frequent in depths of some few meters. Neither do the investigations afford any definite information as to whether the young stages are entirely confined to the shallow littoral region or if they can be found in greater and smaller quantities in deeper waters of the fjords. This also applies to the question, where the coalfish of the I- and II-group go, when they leave the shallow water.

Table 6.

Length of coalfish in simultaneous eel hand seine and trawl hauls in Skaale Fjord.

Date	29/6 1927			
Depth	8–0 m Aa.		40–50 m Trawl	
Gear	15 hauls		30 Min.	
cm	I. gr.	II. gr.	I. gr.	II. gr.
35	..	..	..	..
34	..	..	..	..
33	..	..	..	..
32	..	1	..	..
31	..	..	..	3
30	..	2	..	..
29	..	..	..	1
28	..	1	..	..
27	..	..	..	1
26	..	..	..	..
25	..	..	..	..
24	..	..	..	..
23	..	..	..	..
22	..	..	..	..
21	..	..	..	..
20	..	..	..	..
19	..	..	..	..
18	6	..	1	..
17	20	..	19	..
16	45	..	36	..
15	66	..	58	..
14	52	..	63	..
13	17	..	25	..
12	2	..	4	..
11	..	..	..	..
10	..	..	1	..
No. of specimens ..	208	4	207	5
Average length in cm	15,6	30,5	15,2	30,3

For various purposes other kinds of gear have been employed which might be expected to catch the coalfish if it actually were present. Among others, spratt, lobster, and shrimp trawl have been used in numerous localities in the fjords, in depths ranging from about 20 to 80 m. The collections from these investigations contain hundreds of young haddock, whiting, and poor cod of the 0- and I-group, but only a total of 4 coalfish, all of the 0-group, have been caught, of which 3 were damaged and uncertainly identified, and may be from the stomachs of other fish in the hauls, or they may somehow have been carried to the localities by accident. As these fishing gears are drawn along or near the bottom, the absence of the coalfish in this material only shows that the coalfish, young as well as older specimens, do not share the benthonic life in the deeper parts of the fjords of the other species of codfish mentioned.

Trawls with small meshed (9 mm) net covering the cod end were used on numerous localities on the coastal banks, but individuals from the 3 younger age groups have never been observed here. In a trawl hauled from about 75 m depth, outside the southern outlet of Svinø Fjord, on 30th of August 1933 one specimen of the 0-group measuring 7 cm was found. In this locality during the course of the years the whole fishing carried out covered about 25 trawl hours, but coalfish was only seen on this single occasion. The trawl has been employed

only twice in the fjords i. e. a half hour haul in Skaale Fjord in 40 to 50 m on the 29th of June 1927 and in another half hour haul in Kollefjord on 40 to 60 m depth on the 26th of August the same year. In the innermost part of Kollefjord 0- and I-group was found in seine hauls, but coalfish were absent from the trawl hauls in this fjord. However, the haul in Skaale Fjord did contain no less than 207 specimens of I-group and 5 of the II-group. On the same date a total of 212 specimens of I- and II-group were caught in 15 seine hauls from the shore in the inner part of the fjord. Table 6 gives the composition of the two samples. It appears here, that the proportions of the numbers of the two age groups and their length composition are nearly identical, and thus it is not especially the larger individuals which were found in the deeper part of the fjord. The catch of I- and II-group specimens in 40 to 50 m depth in Skaale Fjord disagrees entirely with the other observations, which all show that the coalfish, both the youngest age group and the older, is scarcely found outside the littoral zone in the deeper parts of the fjords. As Skaale Fjord is very narrow the trawl haul was made not far from the shore and the specimens were possibly caught from a shoal near the surface, when hauling in the trawl. If young coalfish really occur in deeper waters in Skaale Fjord it must be supposed that this somehow is due to the special conditions in this threshold fjord. No fishing gear has been used which could catch the young coalfish of more than a few cm length, living pelagically in the surface layers of the fjords, but coalfish of a size which suggest an age of one or two years are frequently caught by the Faroe fishermen by "dorging" i. e. a surface fishery in which hook and line is used from a sailing motor boat.

By direct observations it is found that the coalfish fry in the littoral region leads an errant pelagic life and only rarely approaches the bottom; the stomach contents also show that its food mostly consists of free-swimming species. When the one or two year old individuals leave the littoral zone, they do not seek the greater depths but continue their pelagic life in wandering shoals of immature fish in the upper layers of the water, either in the fjords or over the coastal banks, where they later on are fished by trawlers as grown up fish near the bottom.

As earlier mentioned a total of 787 coalfish of the II-group were caught in about 800 seine hauls, the majority, however, being found on few occasions and in quite a few hauls. In Vestmanhavn 425 specimens of the II-group were found in 6 hauls on the 31st of August and the 1st of September 1911, and in Skaale Fjord 216 individuals of the II-group were caught in two hauls on the 2nd of August 1924, the total of 641 specimens, accounting for a little more than 80 % of all II-group coalfish, having thus been collected in these 8 hauls. In these larger catches it is hardly possible that the two year old fish are stragglers which not yet have left the littoral region. They must be considered as belonging to some of the above mentioned shoals of young pelagic specimens, which have accidentally come within reach of the seine.

VI. Average Rate of Growth.

The material collected in the littoral region can be classed into age groups by the measuring method and thus the average growth of the individuals can be calculated with fair accuracy, the older specimens, however, can only be analysed as to age when samples of scales have been preserved.

To draw up a correct picture of the growth of the coalfish in the Faroe fjords and sounds would require observations on the size composition of the stock repeatedly during the year

and on different localities through several years, but such a complete series of observations is not available. The stations best investigated have been visited twice in several years. On account of this it is impossible to draw up curves of the average growth in different localities

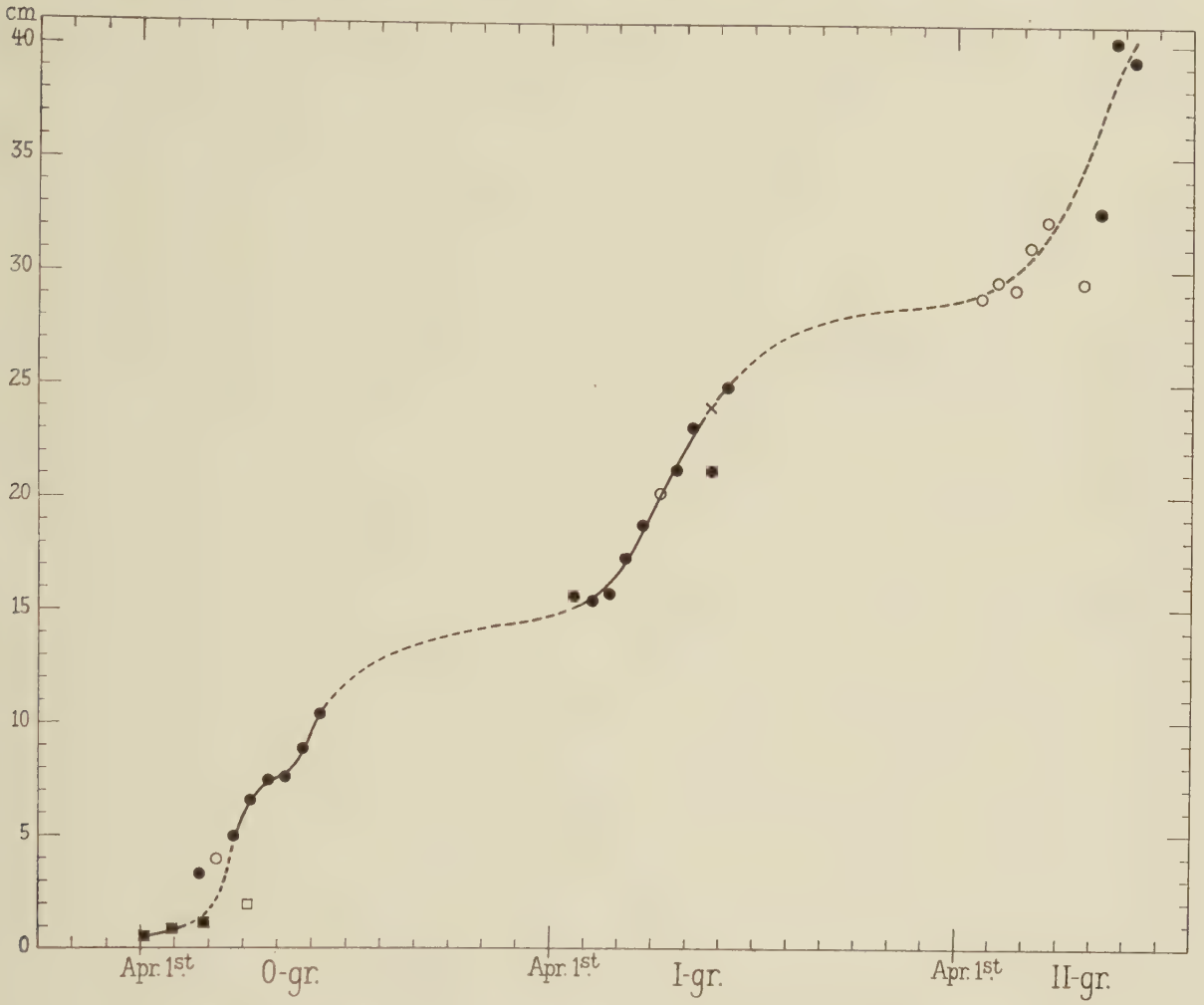

Fig. 9. Average growth rate of coalfish of the three youngest age groups in Faroe waters based on mesurements of about 50.000 specimens. ■ pelagic stages. ● littoral stages. Open symbols show the average length of less than 100 specimens. × Average length of the I-group from August 15th to 31st, when the collections from 1927 are excluded (see text).

and from this basis deduct the average growth of the whole area. To obtain adequate material from all dates investigated in the year, the observations from all localities visited must be combined.

The tables in the appendix show all measurements carried out on coalfish from seine hauls. Samples collected within the same half month are grouped together. The collections from each group are summarized in table 7 giving the successive change in the length composition of the six summer months.

In fig. 9 the average length of each age group for each period have been given graphically. The points form approximately a waved curve which, with some reservation, may be regarded

Tab

Summary of all coalfish measurements from eel hand se

Period	16/4—30/4			1/5—15/5			16/5—31/5			1/6—15/6		
No. of hauls	48			41			86			32		
Age group	0	I	II	0	I	II	0	I	II	0	I	I
cm												
46	..	..	..	..	..	..	..	..	..	..	..	
45	..	..	..	..	..	..	..	..	..	..	..	
44	..	..	..	..	..	..	..	..	..	..	..	
43	..	..	..	..	..	..	..	..	..	..	..	
42	..	..	..	..	..	..	..	..	..	..	..	
41	..	..	..	..	..	..	..	..	..	..	..	
40	..	..	..	..	..	..	..	..	..	..	..	
39	..	..	..	..	..	..	..	..	..	..	..	
38	..	..	..	..	..	..	..	..	..	..	..	
37	..	..	..	..	..	..	..	..	..	..	..	
36	..	..	..	..	..	..	..	..	..	..	..	
35	..	..	..	..	..	1	..	..	..	..	..	
34	..	..	..	..	..	1	..	..	1	..	..	
33	..	..	2	..	..	1	..	..	1	..	..	
32	..	..	..	..	..	4	..	..	..	..	..	
31	..	..	2	..	..	5	..	..	..	..	..	
30	..	..	4	..	..	5	..	..	1	..	..	
29	..	..	4	..	..	6	..	..	2	..	..	
28	..	..	6	..	..	6	..	..	2	..	..	
27	..	..	5	..	..	4	..	..	1	..	..	
26	..	..	3	..	..	5	..	..	3	..	..	
25	..	1	2	..	..	2	..	..	..	..	..	
24	..	2	..	..	..	..	..	2	..	..	..	
23	..	4	..	..	4	..	..	2	..	..	5	
22	..	7	..	..	3	..	..	11	..	..	7	
21	..	18	..	..	7	..	..	13	..	..	8	
20	..	14	..	..	18	..	..	29	..	..	28	
19	..	46	..	..	49	..	..	80	..	..	74	
18	..	93	..	..	115	..	..	151	..	..	159	
17	..	154	..	..	259	..	..	304	..	..	256	
16	..	195	..	..	402	..	..	537	..	..	256	
15	..	237	..	..	473	..	..	842	..	..	114	
14	..	224	..	..	476	..	..	722	..	..	49	
13	..	172	..	..	321	..	..	309	..	..	9	
12	..	100	..	..	183	..	..	89	..	..	3	
11	..	48	..	..	35	..	..	14	..	..	..	
10	..	17	..	..	6	..	..	2	..	..	..	
9	..	1	..	..	..	..	..	..	..	..	..	
8	..	..	..	..	..	..	..	..	..	..	..	
7	..	..	..	..	..	..	..	..	..	..	..	
6	..	..	..	..	..	..	..	..	..	..	..	
5	..	..	..	..	..	..	1	..	..	..	..	
4	..	..	..	..	..	..	11	..	..	24	..	
3	..	..	..	..	..	..	116	..	..	37	..	
2	..	..	..	..	..	..	32	..	..	1	..	
1	..	..	..	..	..	..	..	..	..	..	..	
No. of specimens	0	1333	28	0	2351	40	160	3107	11	62	968	
Average lengt in cm	..	15,6	28,9	..	15,4	29,6	3,3	15,7	29,2	3,9	17,3	3

ections 1903—1939 classed in half monthly periods.

$^{16}/_{6}$—$^{30}/_{6}$			$^{1}/_{7}$—$^{15}/_{7}$			$^{16}/_{7}$—$^{31}/_{7}$			$^{1}/_{8}$—$^{15}/_{8}$			$^{16}/_{8}$—$^{31}/_{8}$			$^{1}/_{9}$—$^{15}/_{9}$		
105			28			24			241			136			56		
	I	II	0	I	II	0	I	II	0	I	II	0	I	II	0	I	II
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1
	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	3
	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	1
	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	7
	..	..	..	..	..	..	..	..	..	..	..	..	..	41	..	..	28
	..	..	..	..	..	..	..	..	..	..	..	..	..	30	..	..	94
	..	..	..	..	..	..	..	..	..	..	1	..	..	17	..	..	66
	.	..	..	..	..	..	..	..	..	..	1	..	..	20	..	..	30
	..	..	..	..	..	..	..	..	..	..	5	..	..	12	..	..	33
	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	17
	..	1	..	..	..	..	..	..	..	..	18	..	..	..	..	..	7
	..	..	..	..	..	..	..	..	..	..	31	..	..	4	..	..	8
	..	4	..	..	..	..	..	..	..	1	41	..	..	1	..	..	1
	..	2	..	..	..	..	..	..	..	..	46	..	..	..	..	..	1
	..	1	..	..	..	..	..	..	..	4	30	..	1	..	..	1	..
	..	2	..	..	..	..	..	..	..	12	..	..	2	..	..	4	..
	..	..	..	..	..	..	1	1	..	27	34	..	4	..	..	4	..
	1	1	..	..	..	..	..	..	..	42	11	..	6	..	..	7	..
	5	..	..	..	..	..	4	..	..	81	7	..	27	..	..	28	..
	5	..	..	..	..	..	2	..	..	99	1	..	60	..	..	79	..
	16	..	..	..	..	..	6	..	..	181	..	..	63	..	..	109	..
	45	..	..	3	..	..	7	..	..	241	..	..	82	..	..	91	..
	63	..	..	1	..	..	15	..	..	245	..	..	96	..	..	65	..
	94	..	..	3	..	..	38	..	..	157	..	..	68	..	..	42	..
	138	..	..	7	..	..	43	..	..	148	..	..	55	..	..	20	..
	261	..	..	5	..	..	41	..	..	133	..	..	90	..	..	2	..
	340	..	..	2	..	..	33	..	..	114	..	..	118	..	2	2	..
	384	..	..	2	..	..	17	..	..	81	..	..	128	..	4	..	..
	337	..	..	1	..	..	4	..	..	60	..	3	117	..	6	..	..
	242	..	..	4	..	..	8	..	1	42	..	15	67	..	31	..	..
	186	..	..	1	..	..	2	..	16	8	..	51	31	..	85	..	..
	130	..	..	1	..	4	..	..	39	1	..	178	8	..	176	..	..
	35	..	..	..	..	12	..	..	115	1	..	454	..	..	372	..	..
	4	..	4	..	..	15	..	..	248	..	..	699	..	..	701	..	..
2	..	..	16	..	..	54	..	..	595	..	..	1015	..	..	931	..	..
4	..	..	49	..	..	119	..	..	931	..	..	1222	..	..	818	..	..
3	..	..	113	..	..	194	..	..	1222	..	..	1162	..	..	605	..	..
5	..	..	135	..	..	249	..	..	1571	..	..	1150	..	..	544	..	..
9	..	..	185	..	..	294	..	..	1955	..	..	1108	..	..	520	..	..
9	..	..	273	..	..	286	..	..	1693	..	..	1286	..	..	454	..	..
6	..	..	333	..	..	317	..	..	1833	..	..	11144	..	..	135	..	..
6	..	..	209	..	..	182	..	..	1638	..	..	523	..	..	12	..	..
0	..	..	100	..	..	14	..	..	284	..	..	42	..	..	1	..	..
3	..	..	6	..	..	..	..	..	6	..	..	..	..	..	..	..	..
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	2286	11	1423	30	0	1740	221	1	12147	1678	232	10052	1023	136	5397	454	299
	18,7	32,3	6,5	20,2	..	7,4	21,2	29,5	7,5	23,1	32,5	8,9	21,1	40,2	10,4	24,9	39,4

as the normal curve of growth for the coalfish, in its first years. As the table shows, the average size of the II-group has been based on rather inadequate material in several cases; on account of this these points fall rather far to the sides of the freehand curve. Neither regarding the 0- nor the I-group do the points lie as regularly as would be expected from such a large number. The reason is, that the collections are very scattered, both as regards the localities and the dates of catching, so that the figures from some of the time intervals are dominated by samples, from localities or years, in which growth differed essentially from the normal. This is especially conspicuous in the average length of the I-group from the 16th to 31st of August, where measurements of a little more than 1000 I-group coalfish are available, but more than half of them were caught in 1927 at the northern island, where the average length of the I-group then was abnormally low. Excluding this year, the average length is 23,9 cm which is very close to the curve, on which it is marked with a cross.

The catches with seine of the 0-group at the end of May and the beginning of June consist of the largest specimens, which have immigrated to the littoral region while the rest of the age group still lived pelagically. The average lengths found for this period thus are higher than the average length of the total 0-group, while the average length of the pelagic fry is smaller. The deviation is possibly further increased because a portion of the smallest individuals, living in the littoral region, escape the meshes of the seine. The average length of the pelagic coalfish fry in the samples earlier mentioned from the spring, is plotted as squares, and the course of the curve during May and the beginning of June is estimated with reference to the remarks made on the course of the immigration. It is not till after the middle of June that the immigration has advanced so far that the average length of the coalfish fry in the littoral region represents the average length of the whole year-class.

It must also be taken into account that the sharp reduction to which the stock, especially the 0-group, is exposed on account of food competition and attacks from enemies, by preference affects the smallest and weakest specimens; so that the increase of the average length must be supposed to be somewhat quicker than the average growth rate.

Finally the average length of the I- and II-group in the littoral zone cannot be considered as quite typical for the coalfish at this age. The fry commence, so early as in the second summer, to emigrate from this zone, and it may be supposed that the largest specimens of the age group emigrate first. This source of error has hardly any significance, as the curve of growth based on the seine hauls agrees well with the curve constructed from scale measurements on older coalfish.

In table 8 is included the size and age distribution of the 61 line or trawl caught coalfish from which scale samples were taken. The youngest individuals are two years old, the oldest ten. The numbers of all age groups are so small that the growth can only be roughly estimated on the basis of the average lengths. The age determination of the three oldest age groups is rather uncertain, but the first 6—7 growth periods of the scales are generally clearly marked.

Assuming that the scales grow approximately in proportion to the length of the animal, as has been proved in many other fish, it is possible, by measuring the distance from the scale centre to each outer limit of the zones of growth, to calculate its length at the end of single periods of growth (l_n in the table). An examination of the reliability of this method in case of the coalfish ought to be carried out first, but this requires far more extensive scale material than the present. The distribution of the values found for l_n are given in table 8. The numerical value has been greatly added to by the treatment applied, so that instead of 61 expressions for the

Table 8.

ength and age of line or trawl caught coalfish from the coastal banks of the Faroes. I—X: Length and age when caught. l_n calculated length after n^{th} growth period.

cm	l_1	I	l_2	II	l_3	III	l_4	IV	l_5	V	cm	l_6	VI	l_7	VII	l_8	VIII	l_9	IX	l_{10}	X
...	..	..	..	..	..	..	..	..	3	1	98 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	..	..	..	..	..	..	5	..	97 ...	..	..	1	1	..	..	..	..	1	1
...	..	..	..	..	..	..	..	..	..	..	96 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	..	..	..	..	..	..	2	..	95 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	..	..	..	..	..	..	2	..	94 ...	..	..	..	..	..	..	1	..	..	..
...	..	..	..	..	..	..	..	..	1	1	93 ...	..	..	..	..	..	1	..	..	..	..
...	..	..	..	..	..	..	..	..	2	..	92 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	..	..	..	..	1	..	4	..	91 ...	..	..	..	..	2	1	..	..	..	..
...	..	..	..	..	..	..	..	..	1	..	90 ...	..	..	..	..	..	..	..	..	1	1
...	..	..	..	..	..	..	1	..	2	..	89 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	..	..	..	..	1	1	6	..	88 ...	..	..	..	..	..	1	..	..	..	..
...	..	..	..	..	..	..	..	..	..	..	87 ...	..	..	1	..	1	..	..	..	1	1
...	..	..	..	..	..	..	1	..	1	..	86 ...	..	..	1	1	..	1	1	1	..	..
...	..	..	..	..	..	..	2	..	2	..	85 ...	1	..	..	..	2	2	..	..	..	..
...	..	..	..	..	..	1	2	..	..	..	84 ...	1	1	1	1	1	..	..	..	..	..
...	..	..	..	..	..	..	4	..	2	..	83 ...	..	..	1	1	2	1	1	..	..	..
...	..	..	..	..	..	1	1	..	1	..	82 ...	..	1	1	.	1	..	..	1	..	..
...	..	..	..	..	..	..	3	..	1	..	81 ...	..	..	..	..	..	..	2	..	..	..
...	..	..	..	..	..	..	1	..	2	..	80 ...	1	..	6	2	..	1	1	1	..	..
...	..	..	..	..	2	2	4	..	..	..	79 ...	..	..	1	2	1	..	..	..	..	..
...	..	..	..	..	2	1	2	..	..	..	78 ...	3	..	3	1	2	..	..	..	..	..
...	..	..	..	..	..	1	1	..	..	..	77 ...	1	..	1	1	..	..	..	..	..	..
...	..	..	..	..	3	3	1	..	..	..	76 ...	1	..	1	..	1	..	..	..	..	..
...	..	..	..	..	2	1	1	..	..	..	75 ...	1	..	3	2	1	..	..	..	..	..
...	..	..	..	..	..	1	5	..	..	..	74 ...	1	..	3	1	..	..	..	..	..	..
...	..	..	..	..	1	..	2	..	..	..	73 ...	2	2	..	..	..	..	..	..	..	..
...	..	..	..	1	4	1	1	..	..	..	72 ...	2	2	..	..	..	..	..	..	..	..
...	..	..	..	..	5	1	1	..	..	..	71 ...	4	..	2	..	..	..	..	..	..	..
...	..	..	..	1	5	..	2	..	..	..	70 ...	5	..	2	1	..	..	..	..	..	..
...	..	..	..	..	2	..	..	..	..	..	69 ...	2	..	..	..	..	..	..	..	..	..
...	..	..	..	..	2	..	1	..	..	..	68 ...	2	1	..	..	..	..	..	..	..	..
...	..	..	..	1	1	..	..	..	..	..	67 ...	2	..	..	..	..	..	..	..	..	..
...	..	..	..	..	5	..	..	..	..	..	66 ...	1	..	..	..	..	..	..	..	..	..
...	..	..	..	1	3	..	..	..	..	..	65 ...	1	..	..	..	..	..	..	..	..	..
...	..	..	3	3	5	..	..	..	..	..	64 ...	1	..	..	..	..	..	..	..	..	..
...	..	..	2	2	..	..	..	..	..	..	63 ...	1	..	..	..	..	..	..	..	..	..
...	..	..	2	1	1	..	..	..	..	..	62 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	5	..	5	..	..	..	..	..	61 ...	2	..	..	..	..	..	..	..	..	..
...	..	..	4	..	2	..	..	..	..	..	60 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	3	..	..	..	..	..	..	..	59 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	5	..	..	..	..	..	..	..	58 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	4	..	..	..	..	..	..	..	57 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	2	..	..	..	..	..	..	..	56 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	5	..	..	..	..	..	..	..	55 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	6	..	..	..	..	..	..	..	54 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	7	..	..	..	..	..	..	..	53 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	8	..	..	..	..	..	..	..	52 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	3	..	..	..	..	..	..	..	51 ...	..	..	..	..	..	..	..	..	..	..
...	..	..	2	..	..	..	..	..	..	..	50 ...	..	..	..	..	..	..	..	..	..	..
...	1	..	..	..	..	..	..	..	..	..	49 ...	..	..	..	..	..	..	..	..	..	..
...	4	..	..	..	..	..	..	..	..	..	48 ...	..	..	..	..	..	..	..	..	..	..
...	2	..	..	..	..	..	..	..	..	..	47 ...	..	..	..	..	..	..	..	..	..	..
...	3	..	..	..	..	..	..	..	..	..	46 ...	..	..	..	..	..	..	..	..	..	..
...	6	..	..	..	..	..	..	..	..	..	45 ...	..	..	..	..	..	..	..	..	..	..
...	9	..	..	..	..	..	..	..	..	..	44 ...	..	..	..	..	..	..	..	..	..	..
...	10	..	..	..	..	..	..	..	..	..	43 ...	..	..	..	..	..	..	..	..	..	..
...	12	..	..	..	..	..	..	..	..	..	42 ...	..	..	..	..	..	..	..	..	..	..
...	3	..	..	..	..	..	..	..	..	..	41 ...	..	..	..	..	..	..	..	..	..	..
...	7	..	..	..	..	..	..	..	..	..	40 ...	..	..	..	..	..	..	..	..	..	..
...	2	..	..	..	..	..	..	..	..	..	39 ...	..	..	..	..	..	..	..	..	..	..
...	2	..	..	..	..	..	..	..	..	..	38 ...	..	..	..	..	..	..	..	..	..	..
tal	61	0	61	10	50	13	38	1	37	2	Total	35	7	28	14	14	8	6	3	3	3
r. ngth	13,1	..	26,3	35,4	38,6	47,3	48,8	58,5	60,2	66,0	Avr. length	71,8	75,4	78,4	80,8	82,6	86,9	84,2	83,8	91,3	91,3

connection between size and age, 333 have been obtained. The averages of the lengths calculated form the very even curve shown in fig. 10. The question remains, however, to what extent this small number of individuals may be regarded as a valid representation of the coalfish stock of the Faroes.

The values calculated for the sizes of the coalfish at the ends of the 1., 2. and 3. period of growth seem to agree well with the curve of growth derived from the seine collections, but a more thorough comparison cannot be made, as the latter material only includes samples from the six summer months and therefore gives no information as to when the growth period sets in.

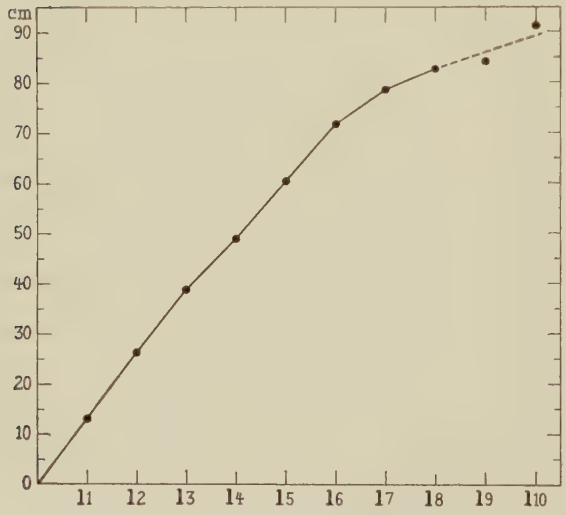

Fig. 10. Average growth rate of Faroe coalfish calculated from scale measurements. l_n length after n^{th} growth period.

In table 9 the average values of l_n and the annual increases in length (t_n) have been calculated for each age group separately; it can be seen, that l_n decreases in passing from younger to older coalfish; this also is related to the increase in length in the 4 to 5 first growth periods (t_1—t_5). This "phenomenon of apparent change in growth rate" was pointed out by Lee (1912) in collections of herring, haddock and trout, and has later been discussed among other by Lea (1913) in the herring and by Thompson (1922) in the haddock. From the explanation of the phenomenon given by Lea and Thompson we may believe that the present case is due to the fact that the coalfish tends to concentrate in shoals of individuals in nearly the same phase of development. In such shoals the youngest age groups are mostly represented by their largest and earliest developed specimens, while on the other hand the oldest age groups are represented by late developed fish of retarded growth.

On closer observation of the curves in fig. 9 and 10 the average course of growth of the coalfish appears to be as follows: During the nearly 3 months of pelagic life the length increases to about 3 cm. As soon as the young have reached shallow water in the fjords the rate of growth increases rapidly and, as in its first month of life, when its size was doubled from 4 to 8 mm so in the first month in the fjords its size is increased from 3 to 6 cm. In July ad at the beginning of August the rate of growth is retarded for a short period. The reason for this irregularity of the curve in this place, cannot be regarded as an accidental variation caused by the heterogeneity of the material, since a similar reduced rate of growth has previously been observed in coalfish in Norwegian fjords in the middle of the summer (Damas 1909 p. 195). In scales of Faroe specimens also a slight secondary ring in the first summer ring is often seen. The cause of this retardation of growth rate is unknown, but a more thorough examination of this question must be postponed for the present. After this period the rate of growth increases again, and at the beginning of September is it at its height; the average size is now 10 cm. Observations for the rest of the year are lacking; according to the scale measurements the length is about 13 cm at the end of the first period of growth. I-group coalfish have not been fished for until the end of April, their average length is then about 15,5 cm and it increases rapidly during the summer reaching 25 cm in the first fortnight of September.

Table 9.

Average l_n and t_n calculated for each age group separately.
l_n: length in cm after n^{th} growth period. t_n: Increase in length in the n^{th} growth period.

Age group	Number of Fish	$l_1=t_1$	t_2	l_2	t_3	l_3	t_4	l_4	t_5	l_5	t_6	l_6	t_7	l_7	t_8	l_8	t_9	l_9	t_{10}	l_{10}
II	10	13,0	14,7	27,7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
III	13	14,5	14,7	29,2	13,9	43,1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
IV	1	14,0	13,0	27,0	14,0	41,0	14,0	55,0	..	..	..	..	..	..	..	..	..	..	..	..
V	2	12,0	13,0	25,0	16,5	41,5	12,5	54,0	12,0	65,0	..	..	..	..	..	..	..	..	..	..
VI	7	11,6	12,9	24,4	12,0	36,4	13,7	50,1	11,3	61,4	11,9	73,3	..	..	..	..	..	..	..	..
VII	14	14,1	11,7	25,8	11,6	36,8	11,4	48,6	12,2	60,9	10,6	71,5	7,4	78,9	..	..	..	..	..	..
VIII	8	11,6	13,5	25,1	13,5	38,6	11,1	49,8	12,8	62,5	10,9	73,4	7,3	80,6	4,3	84,9	..	..	..	..
IX	3	12,3	11,3	23,7	12,3	36,0	10,7	46,7	11,0	57,7	10,7	68,3	6,7	75,0	4,3	79,3	3,0	82,3	..	..
X	3	11,7	10,0	21,7	10,3	32,0	9,0	41,0	10,3	51,3	12,3	63,7	9,3	73,0	7,0	80,0	6,0	86,3	5,3	91,3
Avr. in cm		**13,1**	13,2	**26,3**	12,6	**38,6**	11,7	**48,8**	11,9	**60,2**	11,1	**71,8**	7,5	**78,4**	4,8	**82,6**	4,5	**84,2**	5,3	**91,3**

From scale measurements we find that the I-group has an average length of 26 cm at the end of the growth period. The average length of the coalfish caught as II-group is about 29 cm in the fjords in April and May; during the summertime it rises to nearly 39 cm. Scale measurements lead to about the same result at the end of the period of growth. During the 5 months from 15th of April to 15th of September, the first three year classes grow on an average 2 cm a month, with an almost equal annual increase of about 13 cm. With reference to the calculation of growth a slight decline in the average annual increase is revealed in the following years, this amounts to 11 cm during the sixth, and to 7,5 cm during the seventh period of growth, when the average length is about 80 cm. Finally the annual increase is about 5 cm in the specimens examined of the VII, VIII and IX-groups. The three specimens of the X-group present are 91 cm long on an average.

As shown by Damas the rate of growth of the 3 younger age groups of the coalfish decreases along the shore of Norway from south to north. Comparing the curve of growth, fig. 9, with the examples mentioned by Damas (1909 p. 197) it appears that the age groups in all samples from the Norwegian coast south of 62° N. lat. show average lengths exceeding those of the Faroes, while all average lengths from more northern localities are below. Damas gives the present survey of the increase of growth of the coalfish during its 2nd year of life (Damas 1909 p. 196).

Risør	(about	58°30′ N. lat.)	16 cm
Hvidingsø	(—	59°30′ —)	15 -
Bergen	(—	60°00′ —)	15 -
Romsdal	(—	62°30′ —)	10 -
Trondhjem	(—	63°30′ —)	11 -
Lofoten	(—	68°30′ —)	8 -

As the average increase of length at the Faroes (about 62° N. lat.) is about 13 cm in its second year, it fits in the table between Bergen and Romsdal, leading to the result that the rate of growth of the young Faroe coalfish is similar of those in the Norwegian fjords on the same latitudes.

According to Sæmundsson (1929 p. 21) the coalfish at Iceland grows up more rapidly in the warm waters of the south and west coasts of the island than in the cold waters of the

north and east coasts. The measurements of littoral stages given by Sæmundsson from the former area correspond well with the growth rate at the Faroes. In some of the Icelandic samples the rate of growth was a little more rapid than is the average growth of the Faroe coalfish, in others a little slower.

In fig. 11 the calculated growth rate of the older Faroe coalfish is compared with those of Norway and Iceland. The lower curve is drawn on a basis of published measurements and age analyses on individuals from Romsdal (Damas 1909 p. 194—201) and the upper, which is taken from Sæmundsson (1929, fig. 3 p. 21), represents the growth of the specimens at the northwestern coast of Iceland. The curves in the first three years are nearly identical. In the following period the Faroe curve lies between the other two. Thus having finished its life in the littoral region, the growth rate of the Faroe coalfish is more rapid than at Norway, but it does not reach the rate of growth off N.W. Iceland.

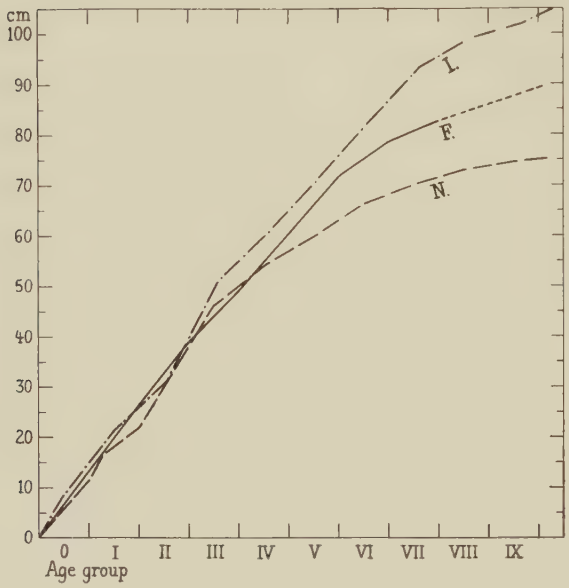

Fig. 11. Calculated average growth rate of Faroe coalfish (*F.*) compared with the growth rate at N.W. Iceland (*I.* after Sæmundsson 1929) and at Romsdal in Norway (*N.* after Damas. 1909)

As the numerous young coalfish in the Faroe fjords have been the object of special fisheries from ancient times, and still furnish a very important article of food in Faroe house keeping, the different size groups have special Faroe names. The 0-group is termed Murtur, and as the newly immigrated littoral stages furnish the staple diet of the tern, these are called Terne—Murtur. Some of these specimens of about 3 to 5 cm are still present in the autumn, as appears from table 7. Coalfish of about 15 to 20 cm are called Summarseiður, as this size is less frequent in the winter months. Table 7 shows that up to August this size includes only I-group specimens, but later individuals of the 0-group exceed 15 cm. Veturseiður are supposed to be one winter old, but may include also specimens of the II-group and correspondingly Tvæveturseiður (two-winter-coalfish) may belong generally to the II- and III-group, as coalfish of about 60 cm are called Træveturseiður (three-winter-old-coalfish) which size includes specimens of the V-group and only the largest individuals of the IV-group, according to table 8. The larger coalfish caught on the coastal banks are called Upsi.

VII. Variation of the Growth Rate.

As the rate of growth of single specimens of the coalfish stock varies considerably it is imperfectly represented by the curves of growth described in the previous section.

In the following the "spread" of the material and the variation of growth rate in the area investigated will be more thoroughly examined.

From table 7 it appears that the range in length of the 0-group increases rapidly during the summer. A more exact expression for this is attained by treating the material as shown for one of the half month periods in table 10 and fig. 12. The length, which is exceeded by 50 % of the individuals (the median) by 25 and 75 % (the quartiles) and by 5 and 95 % (the vigentiles) and finally the maximal and minimal length are calculated in this way both for the seine material, added together in half monthly periods, and for the samples of pelagic young coalfish, previously discussed. Table 11 gives the results attained, and on this basis the diagram of fig. 13 has been drawn. The values of the tables are set out in the middle of the time interval considered except the first and last columns, which denote the sizes of the largest and smallest individuals, caught in these time intervals. Instead of these it was preferred to find in the lists of catches, in relation to the date, the largest and smallest specimens, and plot their lengths at the dates of the catches.

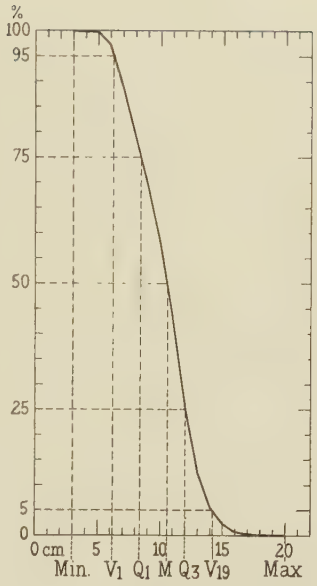

Fig. 12. Cumulative frequency of 0-group coalfish from the period 1/9 to 15/9. Abbreviations as in table 11.

In adding together all samples collected on different dates in the same half month period, and reckoning the length composition in this material as characteristic for a date in the middle of the time interval, an error is committed, the size of which is dependent on the rate of growth in the time interval. This error was avoided as regards the total range of length by the process mentioned above, but the intervigentile and interquartile ranges found may be somewhat too large. It must be assumed that the error is doubled, at the same rate as the time interval. Consequently the extent of the error can be estimated by a comparison of the calculated ranges with the values found when the material is classed into whole months.

Such an estimation has been made, and it shows that the differences between the vigentiles as well as quartiles calculated in the two ways varied rather accidentally in the different time intervals, but they did not exceed ± 0,5 cm. When the 0-group material in the period from 16th May to 15th September was classed in whole months, the interquartile and intervigentile ranges were found to average 49 % and 104 % of the median values respectively. Calculations based on the same material, classed in half month periods, show that the corresponding values were 45 % and 99 %. With doubled time intervals the interquartile and intervigentile ranges thus have risen on an average 5 % of the median values.

The length composition in the samples from the end of May and the beginning of June i. e. in the period

Table 10.

Length frequency of 0-group coalfish from the period 1/9 to 15/9.

	Total No. 5407	‰ af total No.	Cumulative frequency
cm			
20	..	..	..
19	2	< 1	< 1
18	4	< 1	1
17	6	1	2
16	31	6	8
15	85	16	24
14	176	32	56
13	372	69	125
12	701	130	255
11	941	174	429
10	818	151	580
9	605	112	692
8	544	101	793
7	520	96	889
6	454	84	973
5	135	25	998
4	12	2	1000
3	1	< 1	1000
2	..	..	..
1	..	..	..
0	..	..	..

Table 11.

Variation in length of 0-group coalfish. M: median. Q_1, Q_3: the lower and upper quartile. V_1, V_{19}: the extreme vigentiles. Min., Max.: minimal and maximal length.

	Period	Min.	V_1	Q_1	M	Q_3	V_{19}	Max.
Pelagic	$^{27}/_{3}$—$^{7}/_{4}$ 35	0,3	0,34	0,44	0,52	0,62	0,79	1,1
	$^{22}/_{4}$—$^{6}/_{5}$ 34	0,3	0,58	0,75	0,87	1,00	1,22	2,8
Littoral	$^{1}/_{7}$—$^{15}/_{7}$	2,5	3,6	5,1	6,2	7,8	9,9	13,0
	$^{16}/_{7}$—$^{31}/_{7}$	3,0	4,4	5,7	7,2	8,8	11,0	15,0
	$^{1}/_{8}$—$^{15}/_{8}$	2,5	4,2	5,6	7,3	9,1	11,7	17,0
	$^{16}/_{8}$—$^{31}/_{8}$	3,0	4,9	6,6	8,8	10,9	13,4	18,0
	$^{1}/_{9}$—$^{15}/_{9}$	3,0	6,2	8,4	10,5	12,0	14,2	20,0

when the immigration takes place, afford no certain information of the length composition of the total 0-group stock, and the values from this period given in the tables have therefore been omitted in fig. 13, only the length of the largest and smallest variants having been entered. As, in the latter half of June some few pelagic specimens still occur, the values derived from the seine collections are a little too high for this season. This refers especially to the point denoting the length which is exceeded by 95 % of the variants.

The curves are drawn free hand. The median curve is fairly identical with the curve of growth based on the average lengths. The quartile curves limit the length variation of 50 %

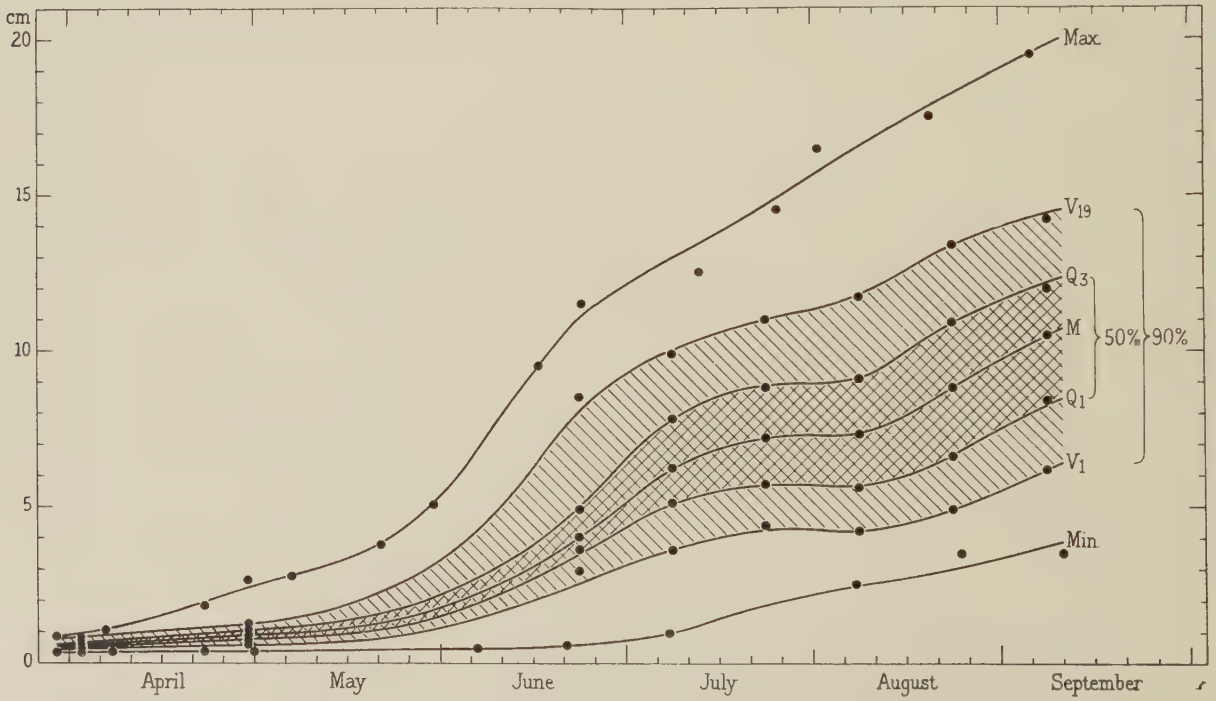

Fig. 13. The variation in growth rate of 0-group coalfish at the Faroes based on measurements of about 35.000 specimens collected during 1903 to 1939. Hatched: The variation of 90 % of the specimens. Doubled hatched: The variation of 50 % of the specimens. M: median. Q_1, Q_3: the lower and upper quartile. V_1, V_{19}: the extreme vigentiles. Min., Max.: minimal and maximal lengths.

Table 12.

Variation in length of 0-group coalfish. M: median. Q_3—Q_1: interquartile range. V_{19}—V_1: intervigentile range. Max.—Min.: total range.

	Period	M	Q_3–Q_1		V_{19}–V_1		Max.–Min.	
		cm	cm	% of M.	cm	% of M.	cm	% of M.
Pelagic	$^{27}/_{3}$—$^{7}/_{4}$ 35	0,52	0,18	35	0,45	87	0,8	154
	$^{22}/_{4}$—$^{6}/_{5}$ 34	0,87	0,25	29	0,64	74	~ 2,5	287
Littoral	$^{16}/_{6}$—$^{30}/_{6}$	4,5	2,3	51	5,6	124	9,5	211
	$^{1}/_{7}$—$^{15}/_{7}$	6,2	2,7	44	6,3	102	10,5	169
	$^{16}/_{7}$—$^{31}/_{7}$	7,2	3,1	43	6,6	92	12,0	167
	$^{1}/_{8}$—$^{15}/_{8}$	7,3	3,5	48	7,5	103	14,5	197
	$^{16}/_{8}$—$^{31}/_{8}$	8,8	4,3	49	8,5	97	15,0	170
	$^{1}/_{9}$—$^{15}/_{9}$	10,5	3,6	34	8,0	76	17,0	162

of the individuals (the double hatched area) and in the same way the variation of 90 % (the total hatched area) is limited by the vigentil curves. The outer curves mark, as mentioned, the limits for the total variation observed. The diagram gives a striking picture of the varying rate of growth of the coalfish and the consequent "spread" in the length composition of the age group. The obliquity of the length frequency is also apparent; while the quartile curves are nearly symmetrical on each side of the median curve, the quarter of the collections consisting of the greatest plus variants has a much greater range of length than the corresponding minus variants.

Until hatching has finished, at the middle or end of May, the lower limits of the length variation is about 4 mm, i. e. the length at hatching. After this time the determination of the lower, as also the upper limit of the variation depends on the extensiveness of the material, and consequently the limits are not absolute, but as the samples from each time interval contain from 1000 to 10.000 specimens, there is only a slight possibility of finding individuals which fall outside the limits. The maximal growth observed in the first summer is about twice as rapid as the average. At the end of May these earliest developed individuals enter the littoral region and reach a length of 5 cm before the end of the month, and measure 20 cm at the beginning of September. The smallest laggards of the year's brood are hatched after the middle of May; they do not enter the littoral region till July and measure hardly 4 cm at the beginning of September. Table 12 shows both the total range of length and the distance between the limits chosen (i. e. the interquartile and intervigentile range) compared with the medians, and given as a percentage of this (the relative ranges). As can also be seen from the diagram the range in length increases rapidly during the summer. In the pelagic stage of about 1st of April the difference is 0,8 cm between the largest and the smallest specimens. 90 % of the variants lie inside a range of 0,45 cm and 50 % inside the 0,18 cm. At the beginning of June the ranges have increased to ten times the values, and, at the beginning of September, the distance between the limits is 20 times as big as about 1st of April. The relative ranges keep nearly constant. In other words the "spread" increases nearly in proportion to the average length.

The interquartile range is about 40 % of the average length, the intervigentile range about equal, and the total range is nearly twice the average length. The proportionality is, as mentioned, not complete. The relative ranges of length are somewhat smaller in the two ringtrawl collections. This, in some degree, may be due to the fact that they both include samples only from a single year.

Table 13.

Variation in length of I-group coalfish. Abbreviations as in table 11 and 12.

Period	Min.	V_1	Q_1	M	Q_3	V_{19}	Max.	Q_3-Q_1		$V_{19}-V_1$		Max.–Min.	
								cm	% of M.	cm	% of M.	cm	% of M.
$^{16}/_{4}$—$^{15}/_{5}$	9,0	12,3	14,1	15,4	16,8	18,9	26,0	2,7	18	6,6	43	17,0	110
$^{16}/_{5}$—$^{15}/_{6}$	10,0	13,3	14,7	15,9	17,2	19,3	25,0	2,5	16	6,0	38	15,0	94
$^{16}/_{6}$—$^{15}/_{7}$	12,0	14,6	16,9	18,6	20,2	23,3	29,0	3,3	18	8,7	47	17,0	91
$^{16}/_{7}$—$^{15}/_{8}$	13,0	17,5	20,6	23,0	24,9	27,9	34,0	4,3	19	10,4	45	21,0	91
$^{16}/_{8}$—$^{15}/_{9}$	14,0	16,7	19,5	23,5	25,8	28,7	32,0	6,3	27	12,0	51	18,0	77

As the growth of the young coalfish rises rapidly as soon as they enter the littoral region, the first arrivals obtain an important start in growth compared with those arriving later, as is plainly apparent from the diagram. The rise in the curve which signifies the arrival sets in first for the upper curve and last for the lower. This shifting of the date for the increase of growth must no doubt account for the fact that the relative spread is greatest in this period.

As the coalfish of the I-group are represented less frequently in the collections than is the 0-group, the calculation of the range of length for the I-group has been performed on a classification by months. Table 13 gives the variant limits and the corresponding ranges of length. As in the case of the 0-group, the "spread" increases during the summer. The ranges of length in spring and the beginning of summer are lower than those of the 0-group during August and September. The relative spread keeps as constant as that of the 0-group. The interquartile range is about 20 % of the median values, the intervigentile range about 45 % and the total range about 93 %. The values are hardly half as great as those of the 0-group but the proportion between them is nearly the same.

It is thus found that the "spread" in the length composition of the coalfish rises rapidly during its first summer, reaches a maximum in the autumn, and decreases slightly during the winter months, to increase again the next summer. The relative spread is nearly constant in the pelagic period, increases slightly during the immigration, and keeps nearly unaltered till the autumn. During the winter months it decreases, and next summer it is only half as great as in the first summer, but then again continues nearly constant.

The slight decrease of the spread in the winter months may be due to the fact that the reduction of the stock chiefly falls on smaller specimens. The material of the II-group and older coalfish is too limited for a similar calculation of the spread. From the results of the growth calculation in table 8, however, the fact appears that the total range of length, as would be expected, increases with age, but decreases in proportion to the average size.

As the material at hand consists of samples from many different years and localities, with different growth conditions, the expressions found for the spread are greater than those which would appear if we were able to follow the growth of a single year class in the same locality. If the material is grouped in localities, it is generally found that many time intervals are represented so incompletely that the expressions for the spread found are very different and uncertain. Only the material from Trangisvaag and Vaag which, in all, includes about half the material, is sufficiently extensive. If the ranges of length are calculated for this portion of the material alone (Table 14) it is seen that the proportion between the values found is essentially the same as in the total material, but the ranges of length are slightly smaller, signi-

Table 14.

Variation in length of 0- and I-group coalfish from Vaag and Trangisvaag. Abbreviations as in table 12.

	Period	M	Q_3–Q_1		V_{19}–V_1		Max.–Min.	
		cm	cm	% of M.	cm	% of M.	cm	% of M.
0-gr.	$^{16}/_{6}$—$^{15}/_{7}$	5,4	2,6	48	5,3	98	8,5	157
	$^{16}/_{7}$—$^{15}/_{8}$	7,3	2,7	37	6,3	86	14,5	199
	$^{16}/_{8}$—$^{15}/_{9}$	9,7	3,6	37	7,6	78	17,0	175
I-gr.	$^{16}/_{4}$—$^{15}/_{5}$	15,2	2,6	17	6,4	42	16,0	105
	$^{16}/_{5}$—$^{15}/_{6}$	15,9	2,4	15	6,1	38	15,0	94
	$^{16}/_{6}$—$^{15}/_{7}$	18,6	2,5	13	7,1	38	15,0	81
	$^{16}/_{7}$—$^{15}/_{8}$	22,7	3,5	15	8,9	39	15,0	66
	$^{16}/_{8}$—$^{15}/_{9}$	24,5	2,4	10	5,6	23	12,0	49

fying that the rate of growth is not uniform all over the Faroes. These local differences in the rate of growth in the Faroe fjords are dealt with below.

In the tables in the appendix, each sample given is the material from a station including a greater or smaller number of hauls with eel hand seine, which generally have been carried out sucessively on a rather restricted area. Table 15 shows two instances of the composition of such samples; it shows that the length freqency in the different hauls from the same station

Table 15.

Length of 0-group coalfish from nearly simultaneous hauls with eel hand seine in Ørdevig and the inner part of Trangisvaag Fjord.

	Ördevig $^{5}/_{9}$ 1911 4 hauls					Inner part of Trangivaag Fjord $^{6}/_{9}$ 1911 5 hauls					
cm	I	II	III	IV	Total	I	II	III	IV	V	Total
19	..	..	..	1	1	..	..	..	1	1	2
18	..	..	..	..	..	..	..	2	..	1	3
17	..	..	..	1	1	1	1	..	2	3	7
16	..	1	..	..	1	1	3	2	3	1	10
15	2	2	2	1	7	3	..	5	2	3	13
14	8	8	5	3	24	9	7	15	6	9	46
13	25	16	13	8	62	17	13	27	11	16	84
12	40	31	22	30	123	4	5	19	7	11	46
11	23	16	19	10	68	5	5	11	3	8	32
10	32	21	15	8	76	3	3	4	3	3	16
9	19	11	9	5	44	..	1	3	2	4	10
8	15	6	4	3	28	..	..	..	1	2	3
7	3	6	1	1	11	..	..	..	..	..	..
6	2	3	..	2	7	..	..	..	..	..	..
5	..	1	..	..	1	..	..	..	..	..	..
No. of specimens	169	122	90	73	454	43	38	88	41	62	272
Average length	11,5	11,5	11,7	11,9	**11,6**	12,5	12,3	12,2	12,5	12,2	**12,3**

is very uniform, and the average lengths of the individuals for each haul deviate at the most some few millimeters from the average of the total sample.

If a greater number of samples are examined in the same way a corresponding uniformity is nearly always found. The average size of the youngest age groups of the coalfish in hauls from the same locality and nearly the same time vary but little. Consequently even small samples suffice to determine the approximate average length of the year classes in the times and places examined.

Only a few samples are at hand which can give information of the variation in the length composition of the coalfish on the same date in different localities within the same fjord. The chosen instances (table 15) were collected simultaneously in Trangisvaag Fjord. It appears that the average length of the 0-group is somewhat higher in the samples from the inner part of the fjords than that from Ördevig, situated closer to the mouth of the fjord.

From each of the years 1924, 1925 and 1927 one sample is at hand from the innermost parts of Skaale Fjord and a simultaneous one from Kongshavn in the mouth of the fjord.

The following average lengths were found:

	Skaale Fjord	Kongshavn
2nd Aug. 1924	9,4 cm	7,1 cm
17th Aug. 1925	10,7 -	9,9 -
22.—29th Aug. 1927	11,6 -	10,7 -

In these cases also the average length of the 0-group is largest at the inner end of the fjord. Finally table 16 comprises a series of samples from the inner parts of Vaag Fjord, collected on the same date in September 1903; localities I—V being successively nearer to the bottom of the fjord. It appears that the average length of the 0-group is considerably higher in the inner than in the outer localities, in spite of the distance between being only 1,5 km. Thus it seems to be a general rule that the 0-group coalfish are larger in the inner parts of the fjords than in localities nearer the mouth.

If we consider the size distribution of the 0-group in the samples from Vaag Fjord shown in fig. 14, we find that all five frequency curves are bimodal. As before mentioned this must be due to the fact that the immigration has taken place in two waves. The first individuals to arrive constitute the upper mode and the later arrived specimens the lower mode. The latter is dominant in the two outer samples, whereas the upper mode is greatest in the samples from the innermost parts of the fjord. Both modal lengths are nearly the same in all samples. If the difference in average length had been due to different growth rates in the different localities, the proportion between the two size groups would have been uniform in all samples and the modal lengths would have differed as much as the average lengths. In other words the difference of size is owing to the

Table 16.

Average length of coalfish caugt in eel hand seine in different parts of Vaag Fjord Sept. 9th 1903. I to V successively nearer to the bottom of the fjord.

Sample No.	No. of hauls	0-gr		I-gr		II-gr	
		No. of spec.	Avr. length cm	No. of spec.	Avr. length cm	No. of spec.	Avr. length cm
I	2	524	7,7	4	24,3	0	..
II	1	249	8,1	5	23,1	0	..
III	1	203	10,4	137	24,9	3	34,2
IV	1	754	11,5	4	24,8	0	..
V	3	315	11,3	127	24,6	3	36,5

fact that the first immigrated individuals, and accordingly largest specimens, of the 0-group mostly live in the inner parts of the fjords.

We must suppose that the fry at the immigration go as far as possible into the fjords, where as a rule the littoral region is very broad and shallow. Consequently this place is the first populated, and the later arrivals meet with a stock of which many have reached a size which makes them dangerous enemies to the smaller coalfish, the latter accordingly mainly seek the less populated littoral region more away from the inner end of the fjord, where there is less food competition.

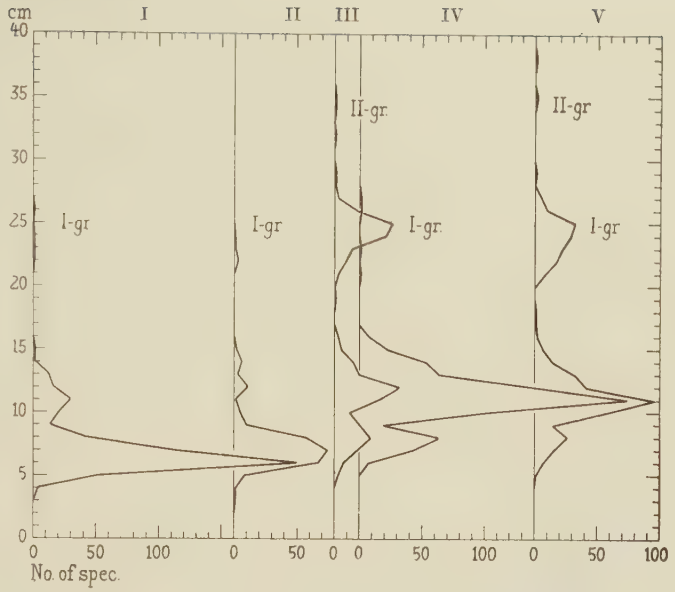

Fig. 14. Length frequency of coalfish caught 9th of September 1903 in 5 different localities on the shore of the inner part of Vaag Fjord. I—V successively nearer to the bottom of the fjord.

As the majority of the present eel hand seine collections has been made in localities on the inner parts of the fjord, it may be assumed that the larger individuals of the 0-group account for a somewhat greater percentage in the collections than in the total stock, which must be taken into account with reference to the calculated curves of growth rate.

In a few cases eel hand seine collections have been carried out near the whaling stations, namely in Funding Fjord in 1903 and at Lopra in Vaag Fjord in 1910, 1912 and 1932. The average size of the age groups of the coalfish in these samples are considerably higher than in simultaneous samples from the inner parts of the fjords (table 17). The samples, from the whaling stations, however, contain but few specimens, and in the samples from Lopra the sizes of the specimens lie within the range of length found in the inner part of the fjords. Consequently, hardly any definite conclusions can be deduced from the material, but the samples indicate that the offals from the whaling stations constitute especially good life conditions for the young coalfish, possibly serving as nourishment for some of the food items, such as e. g. amphipods. The station at Lopra was not at work in the years 1931 and 1932, but the effect of the offal on the invertebrate fauna very likely continues for some years.

In order to compare the growth rates of the coalfish in the different fjords, and in the different years in which the investigations have been carried out, the average sizes of the age groups in each sample from the same date and locality have been plotted in a coordinate system at the date of catch and as a parallel the curve of the average growth rate for the total eel hand seine material has been entered (fig. 15 and 16). The average size of less than 10 specimens are denoted by an open symbol. The II-group altogether is so poorly represented in the collections that the comparison only includes the two first age groups.

The points are distributed in a rather broad field round the curve, as the average lengths of the age groups vary considerably. As to the 0-group nearly half of the average length of the samples lies 1 cm above or below the curve, about 25 % deviate more than 2 cm and a few of these even deviate from 3 to 4 cm. The average lengths of the I-group are even more scattered,

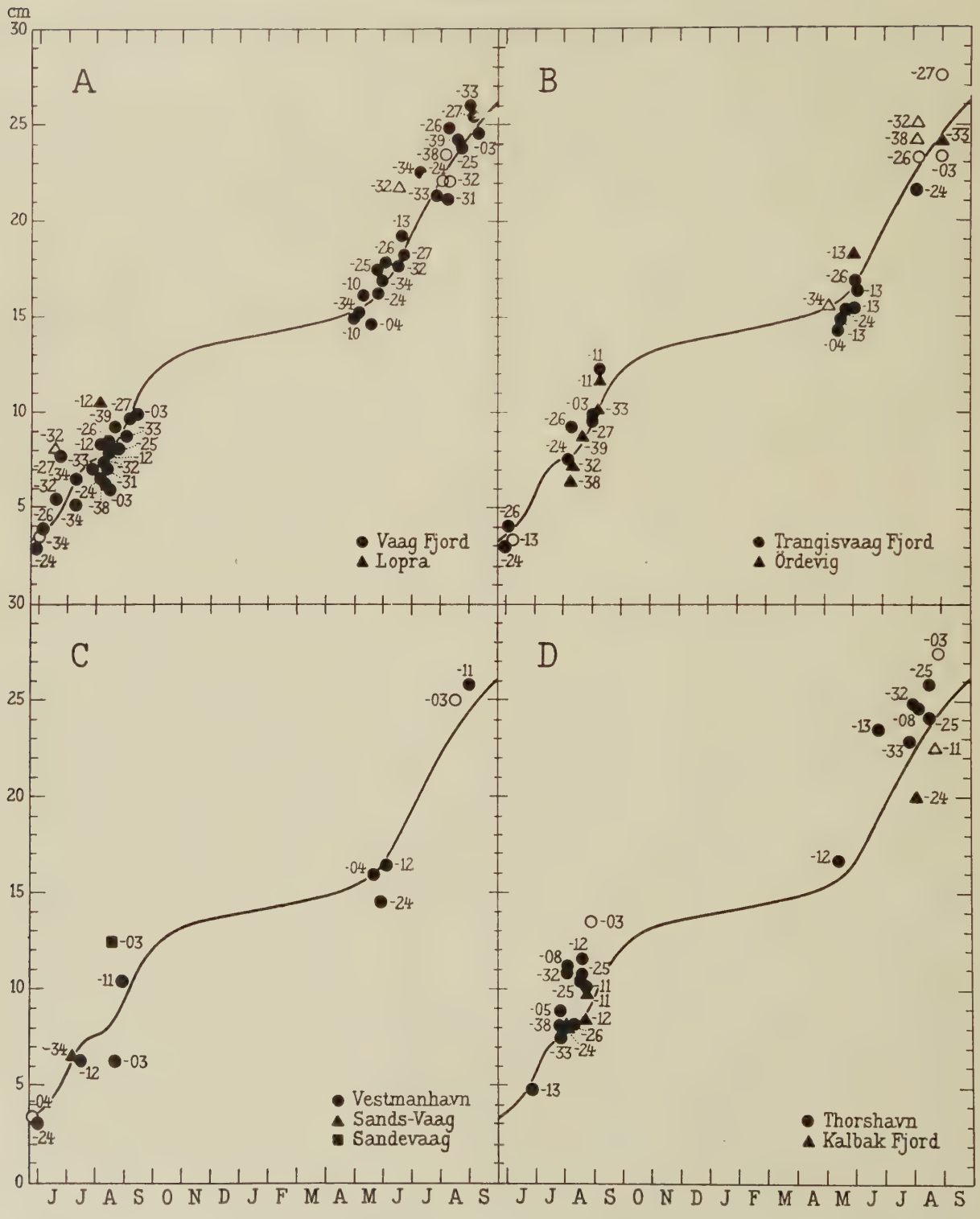

Fig. 15. Average length of 0- and I-group coalfish in each sample collected with eel hand seine in Faroe fjords between 1903 and 1939 compared with the curve of average growth rate of the total material. Average length of less than 10 specimens are shown with open symbols. The months are indicated by their initial letters in capitals.

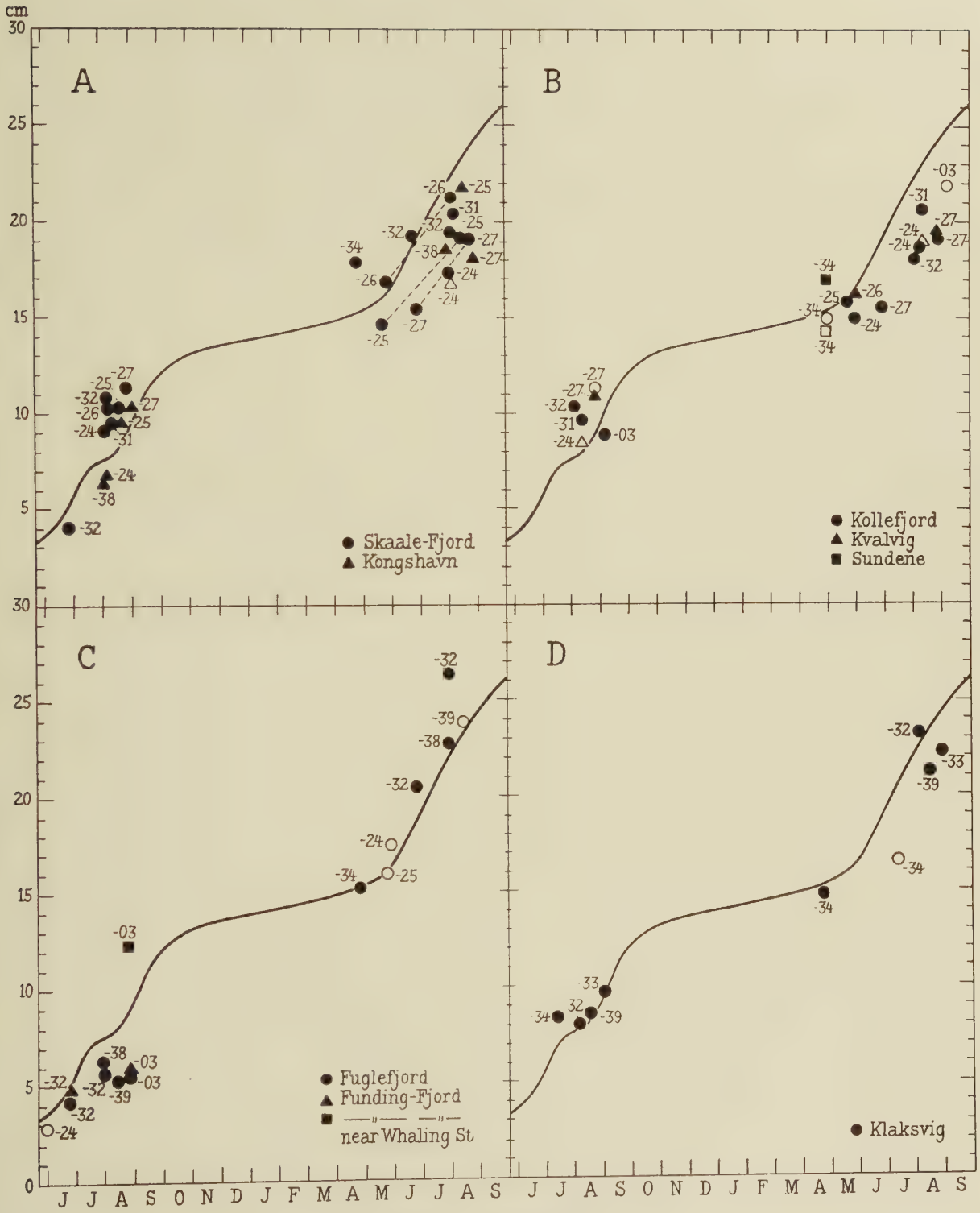

Fig. 16, cf. text fig. 15.

Table 17.

Length of coalfish from simultaneous hauls near a whaling station and in the inner part of the same fjord.

	Funding Fjord 1903		Vaag Fjord 1910				Vaag Fjord 1912		Vaag Fjord 1932			
Date	25/3	25/8	28/4		29/4		3/8	2/8	15-16/6		17/6	
Locality	Inner part	Whaling St.	Inner part		Whaling St.		Inner part	Whaling St.	Inner part		Whaling St.	
age group:	0	0	I	II	I	II	0	0	0	I	0	I
cm												
31	..	..	..	1	..	1	..	..	..	..	..	..
30	..	..	..	3	..	1	..	..	..	..	..	..
29	..	..	..	3	..	..	..	..	..	..	..	..
28	..	..	..	3	..	1	..	..	..	..	..	..
27	..	..	..	3	..	..	..	..	..	..	..	..
26	..	..	..	3	..	..	..	..	..	..	..	..
25	..	..	..	..	1	..	..	..	..	..	..	..
24	..	..	2	..	..	..	..	..	..	2	..	1
23	..	..	1	..	1	..	..	..	..	1	..	..
22	..	..	2	..	1	..	..	..	..	2	..	1
21	..	..	4	..	..	..	..	..	..	5	..	1
20	..	..	2	..	1	..	..	..	..	14	..	3
19	..	..	6	..	6	..	..	..	..	26	..	1
18	..	..	22	..	8	..	..	..	..	29	..	..
17	..	..	46	..	21	..	..	..	..	61	..	..
16	..	..	70	..	25	..	..	..	..	31	..	..
15	..	..	92	..	38	..	..	..	..	17	..	..
14	..	3	89	..	39	..	..	..	..	13	..	..
13	..	4	82	..	23	..	2	2	..	2	..	..
12	..	6	56	..	14	..	8	6	..	1	..	..
11	..	6	25	..	3	..	15	1	..	..	..	..
10	..	2	14	..	..	..	29	1	..	..	..	..
9	..	2	..	..	..	..	40	5	6	..	3	..
8	..	..	..	..	..	..	61	4	40	..	3	..
7	23	..	..	..	..	..	171	1	74	..	2	..
6	71	..	..	..	..	..	120	..	102	..	..	..
5	96	..	..	..	..	..	22	..	238	..	..	..
4	37	..	..	..	..	..	..	..	205	..	1	..
3	..	..	..	..	..	..	..	..	72	..	..	..
2	..	..	..	..	..	..	..	..	8	..	..	..
1	..	..	..	..	..	..	..	..	..	..	..	..
0	..	..	..	..	..	..	..	..	..	..	..	..
No. of specimens	227	23	513	16	181	3	468	20	745	204	9	7
Average length	5,9	12,2	15,0	28,7	15,5	30,2	7,9	10,7	5,5	17,8	8,2	21,8

in 60 % of the samples the deviation from the total average exeed 1 cm, 30 % deviate more than 2 cm and in a few cases from 4 to 5 cm.

Nearly all the points representing the lengths of the 0-group in Skaale Fjord, Kollefjord

and Thorshavn lie above the curve, this also refers to the few samples from Sandevaag and Kvalvig. The average length of the 0-group from Trangisvaag, Vestmannhavn, Klaksvig and Kalbak Fjord are somewhat smaller, and the points are more equally distributed on both sides of the curve. The average lengths from Vaag Fjord follow quite closely those of the latter fjords, but a somewhat greater part of the points are below the curve. Furthest below the total average are the average lengths in the 0-group samples from Fuglefjord — all the points are situated below the curve; this also applies to the few samples from Funding Fjord, excepting the above mentioned sample from near the whaling station.

If the average lengths of the I-group are examined in the same way, we find that for Thorshavn and Fuglefjord the points all lie above the curve, for Vaag and Trangisvaag somewhat lower, but the majority is still above the curve. Below the curve appears the majority of the average lengths from Skaale Fjord and Kvalvig and all the average lengths from Kollefjord and Klaksvig. Accordingly, the growth rate of the coalfish is rather different in the fjords investigated and the average lengths of the two age groups apparently vary independently of each other. While Skaale Fjord and Kollefjord belong to the fjords where the average lengths of the 0-group are highest, it is reversed as to the I-group. In Fuglefjord on the contrary, the average lengths of the 0-group are very small, while those of the I-group are high. However, such a contrast between the two age groups is not a fixed rule. At Thorshavn e. g. the average sizes of both 0- and I-group are above the total average.

The reason for this independent variation must be due to the fact that the average size of the 0-group in the summer only depends on the conditions in the fjords in this season, while the average size of the I-group also is determined by the growth conditions in the rest of the year.

The two threshold fjords Skaale Fjord and Kollefjord show agreement in their deviations from the normal, but elsewhere the growth conditions seem to vary casually from one fjord to another. In order to find the reason for the differences found, more thorough investigations are necessary, both on the local conditions of the fjord and on the feeding habits of the coalfish.

When the same locality is examined at the same season of the year in different years varying values for the average lengths of the age groups are found. If for instance we study the points denoting the average length of the I-group at the bottom of Skaale Fjord (fig. 16 A) it is found that this station was visited twice during the summer in 1925, 1926, 1927 and 1932, though one of the samples from 1932 contains only 20 individuals and is hardly adequately representative. If the points from the same years are combined, the lines denoting the growth rates in 1925, 1926 and 1927 run nearly parallel. Accordingly these have been nearly uniform in the periods between the two collections, but the average length of the I-group in 1926 exceeded the same age group of 1927 by 3,5 cm. On the same date in the summer the latter year class did not reach the average lengths of the former till one and a half or two months later in the summer. Some few years have even greater deviations. The average lengths in samples from 1924 is lower than in samples from 1927 and higher than the same of 1926.

When comparing the average sizes of the 0-group in Skaale Fjord, it is found that the specimens of the year class 1925 which as I-group were larger than those of 1926 as 0-group are smaller than the latter. Correspondingly, as the 0-group, the year class of 1931 had a rather low average length, but as I-group a high. Consequently the size differences of the I-groups of the year classes in question cannot be related to differences in growth during their first summer, but they have risen during the intermediate six winter months.

From many of the fjords samples are from so few years that the material is too small for a comparison, but in the fjords visited more frequently the differences in the average lengths of the year classes agree rather well with those found in Skaale Fjord. The average lengths of year classes, in Kollefjord especially, follow very closely the change in Skaale Fjord, and also in Thorshavn, Vaag and Trangisvaag Fjord practically the same differences are found. The average sizes of the I-group in relation to date and locality are particularly high in 1926, 1932 and 1934 and especially low in 1924, 1927 and 1931.

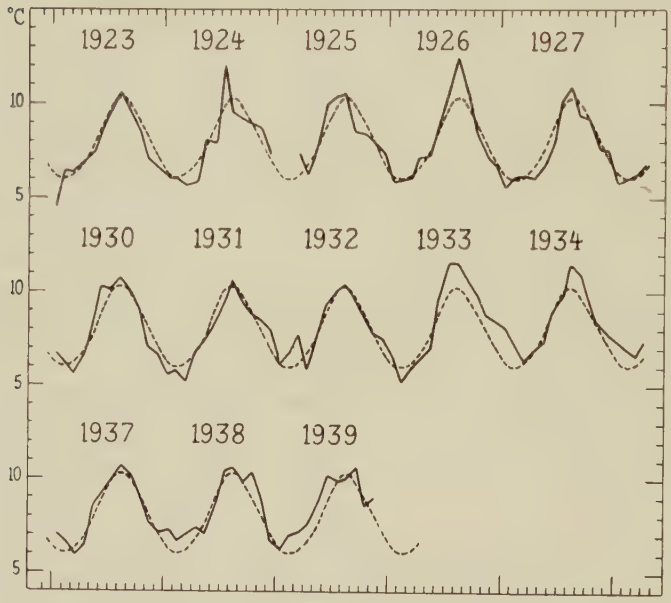

Fig. 17. Monthly mean temperatures of the surface water at the Faroes 1923 to 1927, 1930 to 1934, and 1937 to 1939 (after Nautical Meteorological Annual 1923 to 1939) each year compared with the mean of 40 years (– – – after Ryder 1917).

Monthly mean temperatures of the surface water at the Faroes (fig. 17) clearly indicate the reason for this variation. During the winters preceeding the years when especially low average lengths were found (i. e. 1923—24, 1926—27 and 1930—31) for an unusually long period the temperature was below the normal, in contrast to 1931—32 and 1933—34 and, in some degree also 1925—26 which were particularly short and mild. The collections from 1938 and 1939 are so scanty that the most probable effect of the preceeding mild winters cannot be observed. The connection between the average length of the I-group in the fjords and the temperature conditions in the winter months may of course be a migration phenomenon; it may mean that cold winters cause an emigration of the largest specimens of the year class, but as none of the present collections indicate that the number of individuals of a year class decreases more rapidly from 0- to I-group during an especially cold winter than when the intervening winter is particularly mild, it is most likely that the connection is due to growth conditions in the six winter months.

The 0-group had altogether the highest average length in the years 1927, 1931 and 1932 and the lowest in 1924, 1925, 1933 and 1938, but no obvious connection is found with the temperature of the surface waters in these years. During the former four years the summer temperature was nearly normal, in the first part of the summer the temperature was below the normal in 1927 though, two of the preceeding winters were cold, the third mild. The only conformity observed is that when the first part of the summer was somewhat warmer, the 0-group were of low average size. However, it seems rather difficult to understand that temperatures which exceed the normal by only a few degrees should check the rate of growth, but as the latter, as earlier mentioned does tend to drop in the middle of the summer, it is possible that more thorough investigations e. g. on an experimental basis may prove a connection.

VIII. Quantitative Distribution of the 0- and I-group in the Fjords and Fluctuations in the Size of the Year-classes.

The present coalfish collections from the eel hand seine hauls are only with some reservation fit for quantitative calculations. To be sure all collections have been carried out with seines of equal dimensions, but no doubt the effectivness of the gear depends on a number of varying factors e. g. the weather, the condition of the bottom and the distension of the seine. The lengths of the seine lines is 200 m, but in many cases it was impossible to use the full length of the lines on account of the nature of the bottom. On a few stations the area where it was possible to use the gear was so restricted that several hauls overlap the same bottom area, so that in the hauls carried out, the size of the catches is diminished successively. Finally "holds" have often turned up while hauling in, and even in cases where it was not necessary to free the gear by lifting it, it must be supposed that a portion of the catch has been lost. Therefore hauls from the same locality and of the same date often result in rather uneven sizes of the catch (see e. g. table 15).

As mentioned earlier, a year class is found most numerously in the littoral region immediately after the immigration, and from this date its number per haul decreases rapidly. Thus a comparison of samples from different dates of the year only permit a rather rough quantitative estimation both of the difference in the size of the year classes and of the local coalfish populations in the fjords. Table 18 and 19 show the number of the 0- and I-group coalfish respectively, which have been caught per haul in the fjords visited in course of the year.

As regards the 0-group only the hauls carried out after the 1st of July have been included, while the other table includes all collections, except the few samples which, for one reason or other, are unreliable. Specimens of the II-group are represented so irregularly and incidentally in the samples that a corresponding summary affords no information respecting the quantitative distribution.

As would be expected, the average number per haul varies considerably, and seemingly accidentally. In the collections as shown in table 18, on an average 114 0-group coalfish were caught per haul. The half of the 60 annual averages from the different fjords counts 0—50 specimens per haul, the remaining part varies from 50 to more than 600 per haul. The variation is great in collections from the same fjord also, and the proportion between the number per haul in the different fjords is not the same in different years. The 0-group, however, is altogether most numerous, and frequently amounts to more than 200 individuals per haul in collections from Vestmanhavn (av. 287 per haul), Fuglefjord (av. 202 per haul), Vaag Fjord (av. 183 per haul) and in the few hauls from Sandevaag (av. 221 per haul). A somewhat lower average per haul is found in Klaksvig (av. 101 per haul), Trangisvaag Fjord (av. 74 per haul), Kalbak Fjord (av. 56 per haul) and Thorshavn (av. 44 per haul). In some cases, however, they approximate to 200 individuals per haul, and this average is exceeded by two of the nine collections from Trangisvaag.

Generally the lowest annual averages are found in Skaale Fjord (av. 22 per haul) and Kollefjord (av. 5 per haul) in the few collections from Sands Vaag (1 haul, 30 specimens) and Kvalvig, where a total of 17 specimens were caught in 10 hauls. None of the four annual averages from Kollefjord exceed 5 0-group specimens per haul.

The I-group is represented with an average of 17 specimens per haul (table 19). One third of the 76 annual averages from the different fjords contains more than 10 specimens per haul, a few approximate 200 individuals per haul and nearly one third holds less than one

Ta

Annual average number of 0-group coalfish per haul with eel hand s

	1903	1905	1908	1911	191
Vaag Fjord	304 (9)	..	..	..	393 (
Trangisvaag Fjord	202 (4)	..	..	80 (10)	..
Sands Vaag	..	..	..	..	..
Vestmanhavn	..	..	..	301 (33)	250 (
Sandevaag	221 (2)	..	..	..	..
Thorshavn	..	72 (2)	30 (5)	28 (4)	79
Kalbak Fjord	..	..	..	9 (5)	187
Kollefjord	12 (4)	..	..	..	..
Kvalvig	..	..	..	..	..
Skaale Fjord	..	..	..	..	..
Klaksvig	..	..	..	..	..
Fuglefjord	..	..	..	..	..
Average for all localities...	213 (19)	72 (2)	30 (5)	210 (52)	298 (

Ta

Annual average number of I-group coalfish per haul with

	1903	1904	1908	1910	1911	191
Vaag Fjord	31 (9)	44 (8)	..	158 (13)	..	0 (1
Trangisvaag Fjord	2 (4)	166 (5)	..	..	0 (10)	0 (
Vestmanhavn	..	47 (2)	..	..	8 (33)	7 (1
Thorshavn	..	..	68 (5)	..	0 (4)	2 (
Kalbak Fjord	..	..	..	..	<1 (5)	0 (
Kollefjord	0 (4)	..	..	..	..	..
Kvalvig	..	..	..	..	..	..
Sundene	..	..	..	..	..	..
Skaale Fjord	..	..	..	..	..	..
Klaksvig	..	..	..	..	..	..
Fuglefjord	..	..	..	..	..	..
Average for all localities...	17 (17)	85 (15)	68 (5)	158 (13)	5 (52)	3 (4

specimen per haul. The variation is so great that it is doubtful whether a comparison is possible on this basis. In short the I-group appears to be most numerous in collections from Vaag Fjord, Fuglefjord, Skaale Fjord and Trangisvaag Fjord.

Much the same uncertainty concerns the mutual comparison of the annual average per haul, in some fjords one year especially large numbers per haul are found, while the same year class is poorly represented in some other fjords. In spite of these irregularities it can readily be learned from table 18 that in nearly all localities, in six of the fifteen years of the investigations, namely in 1903, 1911, 1912, 1933, 1938 and 1939, the 0-group occurred distinctly more abundantly than in the other years. In catches from these years on an average two to three times as many 0-group specimens per haul were caught as in the most abundant of the re-

he Faroe fjords later than 1st of July. Number of hauls in brackets.

1924	1925	1926	1927	1931	1932	1933	1934	1938	1939	Total
2 (6)	203 (6)	11 (22)	34 (12)	61 (11)	171 (7)	386 (14)	39 (12)	648 (4)	55 (4)	183 (124)
0 (4)	..	12 (4)	47 (9)	..	31 (14)	30 (8)	..	55 (4)	99 (4)	74 (61)
..	..	..	..	..	..	..	30 (1)	..	..	30 (1)
..	..	..	..	..	..	..	..	..	..	287 (46)
..	..	..	..	..	..	..	..	..	..	221 (2)
..	34 (11)	29 (9)	0 (4)	..	40 (24)	158 (4)	..	70 (2)	..	44 (68)
6 (3)	..	..	..	..	..	..	..	..	..	56 (11)
0 (2)	..	..	2 (5)	5 (10)	5 (4)	..	..	..	..	5 (25)
1 (6)	..	..	4 (4)	..	..	..	..	..	..	2 (10)
4 (6)	28 (5)	38 (9)	10 (16)	8 (18)	2 (10)	..	..	56 (3)	..	22 (67)
..	..	..	..	..	62 (20)	192 (12)	42 (11)	..	185 (4)	101 (47)
..	..	..	7 (6)	..	245 (5)	..	..	241 (4)	399 (4)	202 (19)
4 (27)	79 (22)	20 (44)	19 (56)	22 (39)	61 (84)	225 (38)	40 (24)	240 (17)	185 (16)	114 (481)

nd seine in the Faroe fjords. Number of hauls in brackets.

913	1924	1925	1926	1927	1931	1932	1933	1934	1938	1939	Total
(3)	123 (12)	24 (13)	19 (45)	11 (38)	6 (11)	6 (33)	14 (14)	6 (33)	2 (4)	5 (4)	27 (257)
(16)	11 (7)	..	14 (9)	<1 (9)	..	<1 (14)	5 (8)	<1 (9)	<1 (4)	0 (4)	14 (102)
.	8 (2)	..	..	..	..	..	..	..	..	..	9 (52)
(3)	..	17 (11)	0 (9)	0 (4)	..	8 (24)	3 (4)	..	0 (2)	..	10 (74)
..	21 (3)	..	..	..	..	..	..	..	..	..	6 (11)
..	17 (6)	10 (4)	0 (3)	15 (15)	8 (10)	6 (4)	..	<1 (9)	..	..	9 (55)
..	<1 (6)	..	4 (4)	3 (4)	..	..	..	..	..	..	2 (14)
..	..	..	..	..	..	..	..	4 (12)	..	..	4 (12)
..	14 (6)	10 (7)	15 (14)	24 (31)	9 (18)	8 (25)	..	32 (5)	8 (3)	..	15 (109)
..	..	..	..	..	..	4 (20)	1 (12)	4 (18)	..	8 (4)	3 (54)
..	<1 (7)	2 (6)	..	0 (6)	..	77 (9)	..	41 (9)	9 (4)	1 (4)	25 (45)
(22)	37 (49)	15 (41)	14 (84)	13 (107)	8 (39)	11 (129)	7 (38)	9 (95)	4 (17)	3 (16)	17 (785)

maining years, and more than ten times the number of the poorest years. The total of 178 hauls carried out in these six years contained on an average 232 individuals per haul, while from the remaining years the average of 303 hauls is but 44 0-group specimens.

There is hardly any doubt that these great discrepancies are due to fluctuations in the sizes of the year classes. It must therefore be assumed that the I-group was especially numerous in the years 1904, 1912, 1913, 1934, 1939 and 1940, but, owing to the great sources of error, this is but partly confirmed by the figures in table 19, which show that the I-group on an average was most numerous in hauls from 1904, 1908, 1910, 1913 and 1924. As no collections are at hand of the 0-group of the years 1907, 1909 and 1923 hardly anything can be said with certainty respecting the abundance of these year classes. Both in 1908 and 1910 the investigations covered only a single fjord, and in 1924 the 0-group in numbers exceeding the normal were only found

in three of the eight fjords. The 1903 year class turns up clearly as I-group in 1904, in all three fjords investigated far more I-group coalfish were caught than normally, and in 1913 this was the case also in two of the three fjords covered, but in 1934 the number per haul below or above the normal was equal and in the majority of the samples from 1912 and 1939 the number per haul was below the normal.

Thus the fluctuation of the size of the year classes of the coalfish can only with some difficulty be followed by help of eel hand seine investigations in the fjords.

Undoubtedly, it could be done with some accuracy if collections were carried out in the same season of the year in the same fjords, and with sufficient consideration of the various sources of error mentioned above, but absolute certainty will be achieved only in connection with age-analyses of adequately representative samples of coalfish from the coastal banks of the Faroes.

IX. Food of the Coalfish.

No previous investigations of the food of the pelagic young coalfish are available. *A priori* it may be assumed that in this period, like other pelagic young fish (see e. g. Mielck 1925, Goodchild 1926 and Lebour 1918 and 1919) it would feed on Zooplankton, mostly juvenile copepods and other crustaceans. This supposition was confirmed by the forty stomach contents analyses from pelagic larvae in the Faroe water, given in table 20. It is found that fish eggs are a food item also, besides the small crustaceans of the plankton.

Table 20.

Stomach contents of pelagic young coalfish.

Month	No. of specimens examined	Length of fish in mm.	Stomach content
April	5	5—6	fragments of copepods juv.
—	5	7—9	fragments of copepods juv.
May	5	10—12	copepods, 1 fish egg.
—	5	12—15	copepods, 1 fish egg.
June	5	15—20	copepods, 2 fish eggs.
—	5	20—25	copepods, 1 fish egg.
—	5	25—30	copepods, cladocera, crab larvae, 1 fish egg.
—	5	30—35	copepods, cladocera, crab larvae, 2 fish eggs.

The food of the 0- and I-group coalfish of the Norwegian coast has been thoroughly investigated by Nordgaard (1902) who at intervals, particularly during the winter months of 1899 and 1901, carried out stomach content analyses on specimens from the skerries at Bergen. He found that the coalfish in its first year of life feed mostly on Zooplankton, contrary to cod of the same age which, shortly after the immigration to the littoral region, commences to eat bottom animals. He gives a list of species of food items found, including young fish and eggs, besides a great quantity of copepods, decapods, mysids, euphausids, amphipods, isopods, ostracods, cladocera and cirripede larvae as well as pteropods, juvenile gastropods, and lamellibranchs, polychæts, *sagitta*, and hydroids. Copepods were the predominating food item during

the autumn and winter, and during February, March and April when the plankton contained but few copepods, these were partly replaced by fish eggs and cypris as well as nauplius-stages of cirripedes.

In spring 1913 Paulsen (1918 p. 18) shows much the same difference between the food items of the two species by examining one year old cod and coalfish from Trangisvaag Fjord. The coalfish ranging from 13 to 33 cm contained mostly crustaceans (numerous copepods and ostracods, a few mysids, cladocera small crabs, euphausians, amphipods and cirripede larvae). Moreover small Ammodytes, fish eggs, small gastropods, annelids and remains of algae were found in small quantities.

At the Faroes and at Iceland 1903 Schmidt (1904 p. 83) observed that small coalfish in great shoals fed upon smaller young fish, and coalfish stomachs were often found filled with tiny young herring, sand-eel and cod. According to Sæmundsson (1908 p. 54 and 1926 p. 252) the food of the small individuals at Iceland consists of various smaller crustaceans *Gammarus, Idothea, Caprella,* small decapods (*Hippolyte*) small herring and nereids.

The formalin preserved material brought home from the Faroes contains a number of samples of 0-group coalfish from August and I-group specimens from May and the beginning of June as well as a single sample from August, in which both age groups are represented. This is not sufficient for following the changes of the food items during the year, but the stomach content analyses confirm and supplement the observations referred to.

Eight samples with a total of 196 0-group coalfish and 144 I-group specimens have been examined (table 21—29). Each stomach content was examined by itself and the approximate percentage volume of each food item was estimated; then the total volume was measured under water in a measuring glass. Consequently, the volumes recorded in the tables are relative and somewhat greater than the volumes of the compressed food items in the stomachs.

In a few cases the volume of each food item was measured. As it is often difficult to estimate the percentages of volumes with greater accuracy the following scale is used: 1) 75—100 %, 2) 50—75 %, 3) 25—50 %, 4) 5—25 %, 5) less than 5 %.

As there are sometimes great discrepancies in the composition of the food, even in individuals of the same length and from the same samples, besides the approximate percentage of volume of each cm-group stomach contents, the tables give the number of specimens, where the food item in question was a component of the stomach content, as well as in how many stomachs it accounted for more than 50 % of the volume.

Table 30 gives a summary of these numbers expressed in percentage of the number of individuals examined. The size and kind of the food animals change obviously with the growth of the coalfish; this is evident e. g. in the samples from Fuglefjord (table 21) where the size of the smallest individuals of the 0-group equals the largest pelagic stages with a stomach content of only about 0,02 cm^3, while the largest specimens of the age group are 3 to 4 times as long, with stomach contents 50 to 100 times greater. Copepods constitute the main part of the food for the smaller individuals in this sample, but their importance is reduced with the growth in size, and often they account for only a few percent of the stomach contents of the larger 0-group specimens. Similarly *Cypris* stages of cirripedes occur rather frequently in the smallest individuals, but are quite absent in the larger, which, in contrast, contain rather frequently somewhat larger crustaceans, such as amphipods and crab larvae. Up to a size of about 10 cm crustaceans and chironomids constitute the essential food items of the coalfish fry from this locality, but, as early as from the size of 9 cm, young coalfish appear in the stomach contents. They formed the major part of the stomach contents in about one third of the individuals exceeding

Table 21.

I. Stomach contents of 0-group coalfish from Fuglefjord 1/8 1932.

Average percent of volume estimated: ●: 75—100 %. ●: 50—75 %. ●: 25—50 %. •: 5—25 % and ·: present but less than 5 %. Heavy type: number of specimens in which the food item was found in the stomach contents. Ordinary type: number of specimens in which the food item accounted for more than 50 % of the stomach contents.

Length, mm	30—39	40—49	50—59	60—69	70—79	80—89	90—99	100—109	110—119	120—129	130—139	Total No.	% of total No.
Average volume, cm³	0,02	0,03	0,06	0,10	0,12	0,20	0,25	0,60	0,67	0,82	2,30		
No. of spec. examined	10	10	10	10	10	10	10	10	6	9	7	102	
Polychæta	—	—	—	1 1 ·	1 1 ·	2 ·	3 1 •	3 1 ·	2 •	1 ·	—	13 4	13 4
Cirripedia	6 •	7 ●	5 •	1 ·	2 ·	—	—	—	—	—	—	21	21
Copepoda	10 9 ●	10 9 ●	10 6 ●	10 6 ●	9 4 ●	10 2 ●	9 1 •	7 •	6 ·	6 1 •	3 ·	90 38	88 37
Amphipoda	—	1 ·	3 ·	3 ·	1 ·	2 ·	3 ·	5 1 •	3 ·	4 ·	1 ·	26 1	25 1
Decapoda	—	—	1 ·	1 ·	—	—	3 ·	4 2 •	1 ·	5 •	1 ·	16 2	16 2
Chironomidæ	1 1 •	3 1 •	4 4 ●	2 2 ●	4 2 ●	7 6 ●	4 2 ●	4 3 •	3 •	4 1 •	5 1 •	41 23	40 23
Gastropoda	—	—	—	2 •	—	—	1 1 ·	1 ·	—	1 1 ·	—	5 2	5 2
Fish eggs	1 ·	2 ·	1 ·	3 ·	5 3 •	3 1 •	5 1 ·	5 1 •	6 3 ●	9 •	7 ·	47 9	46 9
Fish (*G. virens*)	—	—	—	—	—	—	2 2 •	1 1 ●	2 2 ●	3 3 ●	4 4 ●	12 12	12 12

the latter size and on an average they accounted for 50 to 100 % of the volume in the coalfish more than 11 cm long.

The food items found can be divided into two groups: I) Animals from the pelagic fauna of the fjords and the surrounding waters and II) animals associated with the vegetation of the littoral region.

I) The first group includes pelagic crustaceans, larvae of bottom animals and fish eggs. Among the crustaceans the copepods, especially *Calanus finmarchicus*, play the main part as food item. As shown in table 30 they were found in 59 % of all individuals examined and in 13 % of these they predominated. The figures include also the animals of the vegetation e. g. harpacticids. Various crab larvae and cirriped cypris larvae were also found in 11 % to 12 % of all specimens, while hyperids (*Themisto*) and euphausids have been observed in only very few cases. Small bottom stages of *Mytilus edulis* and gastropods were frequently found in stomach contents, but in the sample from Skaale Fjord collected 29th August 1927 (table 24), a few pelagic *Mytilus* larvae appear, together with great quantities of pelagic larvae of *Nassa incrassata*, 1450 specimens of the latter animal being counted in the stomach content of a 7 cm coalfish. Fish eggs are frequent components of the stomach contents, and were found in 34 % of the individuals. Eggs of lemon sole (*Microstomus kitt*) accounted for more than 90 % of those which could be determined. Mostly they were only found in small quantities, but in the sample from Fuglefjord in several cases three or four hundred eggs were found in a single specimen, and, together with copepods, they predominated in all individuals in the sample from Vaag Fjord at the end of May 1924 (table 29), each specimen containing from 1—2000 eggs. Altogether they were predominant in 11 % of all specimens examined.

II) The small coalfish most generally

Table 22.

II. Stomach contents of 0-group coalfish from Kongshavn $^{17}/_{8}$ 1925.
Explanation of symbols etc. in table 21.

Length, mm	60—69	70—79	80—89	90—99	100—109	110—119	120—129	Total No.	% of total No.
Average volume, cm³	0,12	0,20	0,26	0,33	0,36	0,60	0,70		
No. of spec. examined	5	5	5	5	5	5	5	35	
Polychæta	—	—	—	—	—	5 •	2 •	7	20
Ostracoda	2 •	4 •	3 •	1 •	1 •	2 •	—	13	37
Copepoda	5 •	5 •	3 •	3 •	5 •	3 •	2 •	26	74
Schizopoda	1 •	1 •	2 1 •	1 1 •	1 1 •	—	1 1 •	7 4	20 11
Isopoda	2 •	2 •	2 1 •	2 1 •	2 •	2 •	—	11 2	31 6
Amphipoda	5 5 ●	5 5 ●	5 3 ●	4 3 ●	5 4 ●	5 5 ●	5 4 ●	34 29	97 83
Caprellidæ	2 •	2 •	—	1 •	1 •	—	—	6	17
Chironomidæ	3 •	1 •	3 •	3 •	2 •	3 •	1 •	16	46
Lamellibranchiata	2 •	4 •	3 •	1 •	5 •	2 •	4 •	21	60
Gastropoda	2 •	4 •	2 •	1 •	3 •	1 •	1 •	14	40
Fish eggs	—	—	1 •	1 •	2 •	1 •	2 •	7	20

find their food in the fauna associated with the vegetation of the littoral region. Amphipods are represented especially frequently, and in extraordinarily great quantities, in the stomach contents. In 30 % of the coalfish they constitute more than half the content of the stomachs and are represented in 63 % of these (table 30). A great portion of the amphipods found are caprellids, podocerids and other crawling animals from the vegetation, but lysianassids and many other species, which often occur swimming freely are commonly found. Generally larger species as *Gammarus locusta* are eaten by somewhat larger coalfish only. Of other crustaceans from this region harpacticids may especially be mentioned, as playing a part in the food of the smaller 0-group coalfish, as well as mysids and isopods, which constitute an essential portion of the stomach contents in the samples from Skaale Fjord (table 22—26). In several cases large *Idothea sp.* are the dominating food item. Ostra-

Table 23.

III. Stomach contents of 0-group coalfish from Skaale Fjord $^{17}/_{8}$ 1925.
Explanation of symbols etc. in table 21.

Length, mm	60—69	80—89	90—99	100—109	110—119	120—129	Total No.	% of total No.
Average volume, cm³	0,20	0,25	0,44	0,52	0,56	1,0		
No. of spec. examined	1	3	5	5	5	5	24	
Polychæta	—	—	—	1 •	1 •	2 •	4	17
Ostracoda	1 •	1 •	4 •	2 •	1 •	—	9	38
Copepoda	1 •	2 •	5 •	3 •	2 •	2 •	15	63
Amphipoda	1 1 ●	3 3 ●	5 5 ●	5 5 ●	5 4 ●	5 5 ●	24 23	100 96
Caprellidæ	—	—	1 •	4 •	—	1 •	6	25
Chironomidæ	1 •	3 •	5 •	5 •	4 1 •	5 •	23 1	96 4
Lamellibranchiata	1 •	3 •	5 •	3 •	5 •	5 •	22	92
Gastropoda	—	2 •	2 •	1 •	—	5 •	10	42

Table 24.

IV a. Stomach contents of 0-group coalfish from Skaale Fjord $^{29}/_{8}$ 1927.
Explanation of symbols etc. in table 21.

Length, mm	70—79	80—89	90—99	100—109	110—119	120—129	130—139	Total No.	% of total No.
Average volume, cm³	0,3	0,3	0,4	0.4	0,5	0,7	0,9		
No of spec. examined	5	5	5	5	5	5	5	35	
Polychæta	—	1 •	—	—	—	5 1 •	3 1 ●	9 2	29 5
Ostracoda	1 •	1 •	1 •	1 •	1 •	3 •	1 •	9	29
Copepoda	5 •	4 •	5 •	4 •	4 •	3 •	4 •	29	83
Schizopoda	—	—	—	1 1 •	—	—	1 1 •	2 2	5 5
Isopoda	1 •	1 •	—	—	2 1 •	—	3 •	7 1	20 3
Amphipoda	2 •	1 •	3 1 •	4 1 ●	5 3 ●	5 4 ●	5 •	25 9	71 29
Caprellidæ	1 •	2 1 •	1 1 ●	—	—	2 •	—	4 2	11 5
Chironomidæ	1 •	1 •	1 •	1 •	1 •	1 •	—	6	17
Lamellibranchiata	1 •	4 •	1 •	5 •	4 •	3 •	4 •	22	63
Gastropoda	5 4 ●	5 3 ●	4 3 ●	5 1 ●	5 1 •	2 •	1 •	27 12	77 34
Fish eggs	3 •	2 •	2 •	3 •	3 •	3 •	2 •	18	51

cods are frequently found in several of the samples, but always with only a few specimens per stomach. The chironomid larvae observed are associated with the vegetation also, apparently all of them belong to the marine *Chricotopus halophilus* group. In approximately one fourth of the 0-group coalfish examined from Fuglefjord (table 21), they constituted more than half of the stomach contents, and in some cases hundreds of larvae were found in a single specimen. In the remaining samples chironomids were represented in smaller quantities, and they are quite absent in samples from Vaag Fjord. Chironomids were found in a total of 34 % of the coalfish examined and in 81 % they formed the dominant food item. In somewhat larger coal-

Table 25.

IV b. Stomach contents of I-group coalfish from Skaale Fjord $^{29}/_{8}$ 1927.
Explanations of symbols etc. in table 21.

Length, mm	140—149	150—159	160—169	170—179	180—189	190—199	200—209	210—219	Total No.	% of total No.
Average volume, cm³	1,2	1,5	1,6	1,8	2,4	2,0	2,0	2,6		
No. of spec. examined	5	5	5	5	5	5	5	5	40	
Polychæta	1 •	2 •	1 •	—	4 •	4 1 •	2 1 •	1 •	15 2	38 5
Copepoda	5 3 ●	4 2 •	1 •	—	1 •	—	—	—	11 5	28 13
Schizopoda	—	—	—	1 •	1 •	2 •	—	1 •	5	13
Isopoda	1 •	3 •	4 ●	4 2 ●	5 2 ●	2 1 •	5 1 ●	4 1 ●	29 7	73 18
Amphipoda	3 2 ●	5 3 ●	5 5 ●	4 2 ●	5 3 ●	5 3 ●	4 2 ●	4 2 ●	35 22	88 55
Caprellidæ	2 •	—	—	1 •	1 •	—	—	—	4	10
Chironomidæ	—	2 •	1 •	—	2 •	2 •	1 •	2 •	10	25
Lamellibranchiata	1 •	—	2 •	2 •	5 •	3 •	2 •	2 •	17	43
Gastropoda	2 •	1 •	1 •	—	4 •	3 •	2 •	2 •	15	38
Fish eggs	2 •	—	—	2 •	3 •	—	2 •	1 •	10	25
Fish	—	1 •	—	—	—	2 •	1 1 •	—	4 1	10 3

Table 26.

V. Stomach contents of I-group coalfish from Skaale Fjord $^{28}/_{5}$ 1926.
Explanations of symbols etc. in table 21.

Length, mm	140—149	150—159	160—169	170—179	180—189	Total No.	% of total No.
Average volume, cm³	2,0	1,5	1,9	2,4	2,7		
No. of spec. examined	5	5	5	5	5	25	
Polychæta	—	1 •	1 1 •	—	—	2 1	8 4
Ostracoda	2 •	1 •	1 •	1 •	—	5	20
Schizopoda	—	1 1 •	1 1 •	3 2 ●	1 1 •	6 5	24 20
Isopoda	1 •	2 •	1 •	1 •	2 2 ●	7 2	28 8
Amphipoda	5 4 ●	5 3 ●	4 3 ●	1 1 •	2 •	17 11	68 44
Caprellidæ	1 •	1 •	—	—	2 1 ●	4 1	16 4
Chironomidæ	3 •	3 •	4 •	1 1 •	1 1 •	12 2	48 8
Lamellibranchiata	3 •	2 •	3 •	—	—	8	32
Gastropoda	1 1 •	4 1 •	—	—	—	5 2	20 8
Fish eggs	1 •	2 •	—	—	1 •	4	16

fish they were frequently found as pupae. Probably they are a food item easy of access, when they rise to the surface as pupae to metamorphose.

Of lamellibranchs only juvenile *Mytilus edulis* are represented. They were found in 57 % of the individuals from Kongshavn and the innermost part of Skaale Fjord, but they formed the essential part of the food in none of the specimens. In the sample from Fuglefjord young *Mytilus* were observed in a single stomach content only, and they were quite absent in samples from Trangisvaag and Vaag Fjord. Also gastropods were absent in these samples. In the remaining samples various species which are found associated with the vegetation were rather frequently observed. Most commonly *Lacuna divaricata* and *Rissoa interrupta* were represented. These animals, like *Mytilus*, are no essential component of the food, forming the greater part of the stomach contents in but a few exceptional cases.

Table 27.

VI. Stomach contents of I-group coalfish from Trangisvaag $^{31}/_{5}$ 1926.
Explanations of symbols etc. in table 21.

Length, mm	140—149	150—159	160—169	170—179	180—189	190—199	Total No.	% of total No.
Average volume, cm³	1,5	1,4	2,3	2,6	2,0	3,5		
No. of spec. examined	5	5	5	5	5	2	27	
Polychæta	2 •	3 1 ●	3 1 ●	3 2 ●	2 1 •	1 •	14 5	52 19
Schizopoda	1 •	—	1 •	—	1 •	—	3	11
Isopoda	1 1 •	—	—	2 •	—	—	3 1	11 4
Amphipoda	3 2 ●	5 2 ●	3 1 ●	2 1 •	2 •	—	15 6	56 22
Caprellidæ	1 •	—	1 1 •	—	—	—	2 1	7 4
Chironomidæ	1 •	1 •	2 •	2 •	2 •	—	8	29
Fish eggs	4 1 •	4 •	4 •	1 •	2 •	—	15 1	56 4
Fish (*G. virens*)	1 1 •	1 1 ●	1 1 •	2 2 ●	4 4 ●	2 2 ●	11 11	41 41

Table 28.

VII. Stomach contents of I-group coalfish from Vaag Fjord $^{1}/_{6}$ 1926.
Explanations of symbols etc. in table 21.

Length, mm	140—149	150—159	160—169	170—179	180—189	190—199	Total No.	% of total No.
No. of spec. examined	2	5	5	5	5	5	27	
Polychæta	—	1 •	1 •	—	—	1 •	3	11
Copepoda	1 •	3 •	—	—	1 •	—	5	19
Amphipoda	2 •	5 2 •	4 •	1 •	2 •	2 •	16 2	59 7
Fish eggs	2 1 ●	2 •	4 1 •	2 •	1 •	2 •	13 2	44 7
Fish (*G. virens*)	1 •	3 3 ●	4 4 ●	5 5 ●	4 4 ●	4 4 ●	21 20	78 74

Some of the free living polychaets, mainly nereids and phyllodocids, are found in 20 % of the individuals examined and are absent only from the sample from Vaag Fjord, collected May 1924. They form more than half of the stomach content in a total of 4 %. An epitocous phyllodocid was found in rather large quantities in more than half the individuals in the sample from Trangisvaag (table 27).

Next to amphipods the smaller coalfish are the food item most frequently predominating. In 13 % fish remains form more than 50 % of the volume. In the sample from Fuglefjord, collected 1st August 1932 (table 21) a total of 33 young coalfish were found in 16 individuals, ranging from 12 to 14 cm long, and even specimens measuring 9 cm have taken part in feeding on the smaller coalfish: 27 individuals ranging from 14 to 20 cm of length caught in Trangisvaag at the end of May 1926 (table 27) contained 29 0-group coalfish and 27 specimens of the I-group, of a nearly simultaneous sample in Vaag Fjord (table 28), contained 73 young coalfish. In many cases 5 to 6 individuals were found in a single stomach. All coalfish eaten are 0-group specimens near the size of immigration, namely of 30 to 40 mm long. As the small coalfish occur far more abundantly than any other fish species in the littoral region, this cannibalism must account for the earlier recorded enormous reduction of the fry during its first month of life after the immigration. As mentioned, the preserved material includes only coalfish of the 0- and I-group. In an eel seine haul from Vaag Fjord, collected 31 May 1926 an examination on board showed, according to the journals, the following stomach content in II-group coalfish

Table 29.

VIII. Stomach contents of I-group coalfish from Vaag Fjord $^{23}/_{5}$ 1924.
Explanation of symbols etc. in table 21.

Length, mm	130—139	140—149	150—159	160—169	170—179	Total No.	% of total No.
Average volume, cm³	1,8	2,6	3,0	3,1	3,0		
No. of spec. examined	5	5	5	5	5	25	
Cirripedia	4 •	3 •	4 •	5 •	3 •	19	76
Copepoda	5 ●	5 ●	5 ●	5 ●	5 ●	25	100
Amphipoda	4 •	5 •	5 •	4 •	5 •	23	92
Decapoda	3 •	4 •	2 •	5 •	3 •	17	68
Fish eggs	5 5 ●	5 5 ●	5 5 ●	5 5 ●	5 5 ●	25 25	100 100

Table 30.

Summary of table 21—29.

Heavy type: The percentage of the specimens where the food item was found in the stomach contents. Ordinary type: The percentage of the specimens where the food item accounted for more than 50 % of the stomach contents.

Sample No.	I	II	III	IV		V	VI	VII	VIII	Total
Age group	0	0	0	0	I	I	I	I	I	0—I
No. of spec. exam.	102	35	24	35	40	25	27	27	25	340
Polychæta	**13** 4	**20**	**17**	**29** 5	**38** 5	**8** 4	**52** 19	**11**	—	**20** 4
Cirripedia	**21**	—	—	—	**3**	—	—	—	**76**	**12**
Ostracoda	—	**37**	**38**	**29**	—	**20**	**4**	**7**	—	**11**
Copepoda	**88** 37	**74**	**63**	**83**	**28** 13	**4**	—	**19**	**100**	**59** 13
Mysida	—	**20** 11	—	**5** 5	**13**	**24** 20	**11**	—	—	**7** 3
Isopoda	—	**31** 6	**4**	**20** 3	**73** 18	**28** 8	**11** 4	—	—	**17** 4
Amphipoda	**25**	**97** 83	**100** 96	**71** 29	**88** 55	**68** 44	**56** 22	**59** 7	**92**	**63** 30
Caprellidæ	—	**17**	**25**	**11** 5	**10**	**16** 4	**7** 4	—	—	**8** 1
Decapoda	**16** 2	—	—	—	—	**4**	**11**	**7**	**68**	**11** 1
Chironomidæ	**40** 23	**46**	**96** 4	**17**	**25**	**48** 8	**29**	—	—	**34** 8
Mytilus juv.	**1**	**60**	**92**	**63**	**43**	**32**	—	—	—	**24**
Gastropoda	**5** 2	**40**	**42**	**77** 34	**38**	**20** 8	—	—	—	**22** 5
Fish eggs	**46** 9	**20**	**4**	**51**	**25**	**16**	**56** 4	**44** 7	**100** 100	**41** 11
Fish	**12** 12	**3**	—	—	**10** 3	**4**	**41** 41	**78** 74	—	**15** 13

ranging from 27 to 36 cm "hardly anything but small coalfish of the 0-group a few crustaceans and a large postlarval *Centronotus*". That the stomach contents of samples from Skaale Fjord contained no coalfish fry may be due to the fact that only the individuals 3 to 4 cm long are eaten by the older coalfish, and the smallest specimens found here at the time of the investigation all exceeded 5 or 6 cm. It is less understandable that no coalfish were found in stomach contents from Vaag Fjord on the 23rd of May 1924 as individuals 3 to 4 cm long were represented in the same hauls. Most probably the fish eggs dominating the stomach contents in this sample have been available so abundantly that they were the food easiest of access. Other fish remains have only occasionally been found. A young cottid and a young *Centronotus* have been observed, and 3 to 4 stomach contents contained larger fish bones, probably coming from fish dead from other causes. Finally a stomach was found to be quite filled up with herring scales.

Together with food items from the vegetation algal remains occasionally occur which have probably been swallowed accidentally with the food. In some cases also small ball shaped colonies of the genus *Nostoc* appear.

Several of the animals mentioned in this section are found not only swimming, or as epifauna on the vegetation, but also as epifauna or even infauna on or in the bottom material. No doubt though these food items are only quite exceptionally collected from the bottom by the coalfish, as they nearly always are found in the stomach contents together with animals which occour associated with the vegetation only, and as true bottom animals have only been found in less than 1 % of the individuals examined. With certainty such were only observed in two specimens which contained 1 *Pectinaria sp.* besides different animals from the vegetation region. However, a few of the remains of polychaets found may be from bottom

species. In a single case, some remains were found which probably are the bitten off siphons of molluscs (*Macoma*?).

The samples at hand indicate that in the Faroe fjords the composition of the food of the coalfish changes frequently in the course of the year. In some periods, fish eggs copepods or small gastropod larvae occur especially numerously in the plankton, in other periods chironomid larvae and pupae are extraordinarily common, and when the small coalfish immigrate in vast quantities from the waters round the islands, they constitute the food item easiest of access. When a food item rises to such a maximum, it predominates in approximately all stomach contents of the small coalfish. The crustaceans of the vegetation belt are the main basis of the food in the intervals between these maxima. In these periods the stomach contents often vary considerably. Of individuals equal in size from same eel hand seine haul some stomachs e. g. contain hardly anything but podocerids, others hardly anything but caprellids, others again have especially hunted *Idothea* etc. The samples from Skaale Fjord collected 28th May 1926 (table 26) evidently show this specialisation. Some of the food items represented are alternatively dominant in the stomach contents examined, and only one of the 25 stomach contained such a mixture of various species that none of these accounted for more than 50 % of the volume. In 93 % of the specimens examined from all samples the quantity of a single food item exceeded 50 % of the stomach content.

It may be assumed that the small coalfish generally snap at all floating or swimming objects within a suitable size. When a planktonic food item occurs especially frequently, it is eaten nearly in equal proportion by all coalfish of equal size. When no free swimming food items are available in sufficient quantities, the coalfish are forced to select their food among animals associated with the vegetation. This hunting necessitates a more complicated series of reflexes, as in order to find food the coalfish must react on certain shapes, colours, movements or smells, and it is reasonable to believe that the demonstrated tendency to specialisation in the selection of food items must be owing to the fact that a single individual is unable to adapt an equally great power of reaction on a greater number of different sense impressions, but preferently reacts on quite limited impressions.

More thorough investigations are lacking on the food of the older coalfish living on the coastal banks of the Faroes. As at Norway (Nordgaard 1901 p. 13, Collet 1875 a. o.) and Iceland (Sæmundsson 1908 p. 53 and 1926 p. 252) most probably it is composed of pelagic crustaceans (euphausids, hyperids and copepods) cephalopods and fish (herring, sprat, capelan sand-eel etc.). The only older Faroe coalfish examined are 35 individuals about 90 cm long, caught with hand line in about 100 m depth N.E. of the islands at the beginning of July 1937 which contained, according to the journals, euphausids, cephalopods, herring and scopelins.

X. Racial Characters.

In connection with biological studies on the coalfish in Faroe waters, it may be of interest to compare the racial characters of the population with those of populations in other regions.

Schmidt (1909 p. 35) found from countings of the vertebrae in 22 Icelandic and 23 Faroe coalfish that the number ranges from 53 to 56 with an average of 54,8 and 54,6 vertebrae respectively. In continuation of the racial investigations on fish carried out by the late Professor

Table 31.

Average number of vertebrae and of rays in second dorsal fin in coalfish from different localities in North European and Greenlandic waters.

Formulae employed: $\sigma = \pm \sqrt{\frac{\Sigma (V-A)^2}{n}}$; P. F. A. $= \pm 5 \cdot 0{,}6745 \frac{\sigma}{\sqrt{n}}$.

No. of vertebræ	Den-mark	Norway	The Faroes			Iceland				Greenland		
	Frederiks-havn	Salten ab. 67° 30′ N	Vaag Fjord	Kolle-fjord	Total	Havne-fjord	Seydis-fjord	Nord-fjord	Total	Juliane-haab	Arsuk	Total
57.....	..	..	..	..	..	..	..	1	1	..	..	..
56.....	12	11	21	9	30	26	9	21	56	4	17	21
55.....	135	71	69	48	117	60	25	70	155	14	70	84
54.....	70	20	16	21	37	15	5	13	33	1	18	19
53.....	2	..	..	..	..	..	..	..	..	..	..	..
n	219	102	106	78	184	101	39	105	245	19	105	124
A	**54,72**	**54,91**	**55,05**	**54,85**	**54,96**	**55,11**	**55,10**	**55,10**	**55,10**	**55,16**	**54,99**	**55,02**
σ.....	± 0,36	± 0,54	± 0,57	± 0,60	± 0,60	± 0,76	± 0,59	± 0,59	± 0,61	± 0,49	± 0,58	± 0,57
P.F.A..	± 0,08	± 0,18	± 0,19	± 0,23	± 0,15	± 0,26	± 0,32	± 0,20	± 0,13	± 0,38	± 0,19	± 0,17
No. of rays in D_2												
26.....	..	..	..	..	..	..	..	..	..	1	..	1
25.....	..	..	..	..	..	..	..	..	..	..	2	2
24.....	12	4	3	3	6	3	..	4	7	1	7	8
23.....	35	19	15	15	30	16	7	14	37	4	17	21
22.....	42	29	25	14	39	26	6	27	59	6	29	35
21.....	65	30	37	24	61	31	14	31	76	2	29	31
20.....	49	15	20	17	37	14	7	14	35	3	15	18
19.....	14	5	4	4	8	9	3	12	24	1	3	4
18.....	2	..	1	1	2	1	1	3	5	1	1	2
17.....	1	..	..	..	..	..	..	..	..	..	..	..
n	220	102	105	78	183	100	38	105	243	19	103	122
A	**21,28**	**21,53**	**21,31**	**21,32**	**21,32**	**21,32**	**21,11**	**21,19**	**21,23**	**21,74**	**21,66**	**21,67**
σ.....	± 1,37	± 1,20	± 1,18	± 1,32	± 1,24	± 1,29	± 1,27	± 1,40	± 1,34	± 1,80	± 1,33	± 1,48
P.F.A..	± 0,31	± 0,40	± 0,39	± 0,50	± 0,31	± 0,43	± 0,70	± 0,46	± 0,29	± 1,39	± 0,44	± 0,43

Johannes Schmidt the numbers of vertebrae and of rays in the second dorsal fin were counted in some samples of coalfish from different parts of the North Atlantic waters, collected by him for the purpose. Table 31 show the results. In the Faroe samples the average number of vertebrae is 54,96 with a probable fluctuation of ± 0,15.

Schmidt (1930) has shown that the average number of vertebrae in cod populations increases with the decreasing surface temperature towards N.W. The lowest values were found off the West coast of the British Isles and in the North Sea, the highest off Greenland and North America. A similar increase of number of fin rays in D_2 towards N.W. was shown.

The table above shows that the average number of vertebrae in coalfish tends to increase in the same direction, but the differences between the values are very small. The probable fluctuations of the averages of all the samples from Norway, the Faroes, Iceland and Greenland overlap and accordingly, statistically no certain differences appear. Only the average number

in the samples from Frederikshavn on the Danish Kattegat coast may be distinguished with certainty from the remaining values. The probable fluctuations of the average numbers of rays in D_2 overlap even more, only in the samples from Greenland the values seem to be somewhat higher than in the remaining samples.

Dannevig (1933) has published the average number of vertebrae in some samples of coalfish from the Norwegian Skagerak coast. The values vary from 53,40 to 53,68 with a total average of about 53,6 vertebrae. The urostyle has not been counted, and the values thus correspond well with the average found in the Danish sample. From his investigations he concludes that the number of vertebrae diminishes as we pass from the coast into the fjords, as shown in cod by Schmidt (1930) but the differences found are very small and a statistical treatment of the material would possibly not confirm these differences.

As the present samples show less marked differences respecting the racial characters considered than do samples of cod from corresponding localities, it must be assumed either that these characters in the coalfish are less influenced by the determining factors (e. g. temperature) or that the coalfish populations are less stationary than those of the cod and that migrations of coalfish takes place between the different areas.

Only a single marking experiment with coalfish has been carried out. In 1921 Sund (1925) liberated 1000 young specimens and about the same number of larger coalfish near Lofoten on the Norwegian coast. Some very extensive migrations along the coast were observed but no recaptures were made outside Norwegian waters. No doubt marking experiments with coalfish in Icelandic and Faroe waters would yield valuable information.

Summary.

The present paper is based on collections carried out by Danish research vessels in Faroe waters in the years from 1903 to 1939. The material consists of pelagic coalfish young caught in ring trawl, young coalfish from the littoral region caught in eel hand seine, and a small number of older specimens caught by line or trawl.

1. Spawning.

The size frequency of the coalfish larvae in collections taken in the spring indicates that the spawning commences in February, culminates about 1st of April and ends at the beginning of May.

2. Distribution of the pelagic fry.

From the spawning places on the coastal banks, the eggs and larvae spread drifting with the current. At the beginning of April pelagic fry is found all over the banks and between the islands, and is only lacking in the innermost parts of the fjords. Inside the 100 m line the fry is less frequent, and the average size larger than between the 100 and 200 m lines. During April and May this difference is nearly effaced by the currents. At the end of May and the beginning of June the fry is almost as frequent outside as inside the 100 m line, but the difference in size reappears, as the immigration of the larger individuals commences.

Beyond the coastal banks the fry occurs very sparcely. A few larvae, spawned on Faroe Bank or probably more western banks, were observed over the depths between the Faroes and Iceland. North of the Faroe—Iceland ridge no fry has been found, but from the eastern portion of the Faroe area a slight drift of fry enters the Faroe—Shetland Channel. It may be supposed, from a study of the surface drift, that some larvae from the spawning places off the western coast of the British Islands are carried to the Faroe area, and that small quantities of fry, spawned in the latter area, drift to the coastal banks of the Shetland and Orkney islands, to the northern North Sea and even reach the coasts of Norway.

3. Vertical distribution of the pelagic fry.

Schmidt (1909 p. 32) writing about the coalfish fry in the northern Atlantic says that "the rule is that the youngest pelagic stages are found nearest the surface, the older somewhat lower down". No such vertical distribution could be observed in the Faroe area, nor any regular difference in quantity in simultaneous hauls from the surface and somewhat deeper. The strong vertical mixing of the Faroe waters and the consequent uniform temperature and salinity in nearly all water layers surely accounts for the deviation from the rule. None of the collections show that the coalfish untertakes vertical day and night migrations.

4. Immigration of the fry to the littoral region.

The first bottom stages, between 2,5 and 3,5 cm long, appear in the littoral region of the fjords near the outer coasts about the 1st of June, while the inner parts of the long and narrow fjords between the islands are not reached till somewhat later. At the end of May and the beginning of June the fry is scarcely found at all in collections with eel hand seine or ring trawl, as in these months it may be found most abundantly half pelagic, close to land.

The immigration culminates in the latter half of June and the beginning of July and is finished at the end of this month.

5. Reduction of the stock in the littoral region and the emigration.

In the end of July the number of 0-group coalfish per haul with eel hand seine reaches the maximum value. During the following month the number is nearly halved by enemies. During autumn and winter the reduction is about 25 $^0/_0$. During the second summer the number per haul again rapidly declines, as the majority of the one year old specimens now emigrate from the littoral region and commence an errant pelagic life in shoals in the upper layers of the fjords and surrounding waters. The emigration is ended during the following autumn or winter, as the few specimens of the II- and III-group caught by seine must be considered as members of the errant shoals which occassionally visit the littoral region.

6. Average rate of growth.

The curve given in fig. 9 shows the average growth rate of the 3 younger age groups, based on measurements of more than 50 thousand specimens. When the fry has entered the littoral region the growth rate rapidly increases, slows down for a short period in the middle of the summer, but is again high in September at the time the observations ended. The annual increase in length is almost uniform in the three first years i. e. about 13 cm. In this period of life the average growth rates of coalfish from the Faroes and from Norwegian fjords on the same latitude (e. g. near Romsdal, according to Damas 1909) are nearly identical and nearly the same as off N.W. Iceland (Sæmundsson 1929). In the following years it is slower than off Iceland but more rapid than in the Norwegian locality mentioned.

7. Variation of the growth rate.

A diagram has been constructed (fig. 13) showing the length composition of the total 0-group material and its alterations through the first growth period. The maximal growth observed in this period is about twice as rapid as the average. The earliest developed individuals immigrate to the littoral region at the end of May, reach a length of 5 cm during this month and 20 cm at the beginning of September. The latest developed specimens, hatched after the middle of May, do not reach the shore till July, and measure scarcely 4 cm at the beginning of September.

The range in length rapidly increases during the first summer, during the winter it decreases somewhat, and increases again during the following growth period. The relative spread in the length composition (i. e. the range in length in proportion to the average length) is nearly constant in the first growth period, decreases during the winter, and is only half as great in the second summer during which it keeps nearly constant.

As to the variation of the length frequency of the coalfish in the littoral region the following rules are observed: The average length of the 0-group is greatest in the innermost parts of the fjords mainly because the larger specimens of the year group migrate to these localities. The average length is greater near the whaling stations owing to the better food conditions in such places.

The growth rate is different in different fjords. A high average length of the 0-group does not imply a high average length of the I-group in the same fjord, as the first mentioned is dependent mainly on the growth conditions during the summer while the latter is also dependent on conditions during the winter. The growth rate is also different in the different years. Especially low or high average lengths of the I-group are found after abnormally cold or mild winters.

8. Quantitative distribution of the I- and II-group in the fjords and fluctuations in the size of the year classes.

The variation in number of specimens per haul with eel hand seine is very great and appears often to be accidental, as the effectivness of the gear is dependent on various uncontrolable circumstances. In spite of this it is observed that the same differences in abundance in the different fjords tend to be annually repeated, and some annual fluctuations in the size of the year classes are given.

9. Food of the coalfish.

A small number of pelagic larvae ranging from 5 to 35 mm were examined for food. All of them were feeding on copepods. In additions cladocera, crab larvae and fish eggs were found.

In table 21—30 are given the results of the examination of stomach contents of 340 0- and I-group specimens from different Faroe fjords. The food material found can be divided into: 1) animals from the pelagic fauna of the fjords and the surrounding waters and 2) animals associated with the vegetation of the littoral region. True bottom animals were observed only as very rare exceptions. The two most important food materials of the first group are copepods and fish eggs which form the main food of the smaller individuals of the 0-group, and, when especially abundant, the food of all sizes examined. Moreover hyperids schizopods and larvæ of crabs, cirripeds and molluscs are eaten. Generally the creeping or swimming fauna associated with the vegetation afford the staple diet of the young coalfish. Amphipods especially were found

in great quantities, but also mysids isopods, chironomids and errant polychaets were often represented in abundance. Of less importance are harpacticids, ostracods and juvenile molluscs. When the numerous young coalfish enter the littoral region the I- and II-group coalfish almost exclusively feed on the fry of their own species, and a few months later the largest specimens of the 0-group participate in this cannibalism. No coalfish longer than 3 to 4 cm were found in the stomach contents.

10. Racial characters.

Countings of the number of vertebrae and of rays in the second dorsal fin in coalfish from different localities in north European and Greenlandic water (table 31) show that the average values tend to increase with decreasing temperature when passing from Danish to Icelandic or Greenlandic waters, as previously shown in cod by Schmidt (1930). As the differences are less marked than in cod it must be assumed either that these racial characters in the coalfish are less influenced by the determing factors or that the coalfish populations are less stationary than those of the cod.

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Dansk Resumé.

Det foreliggende Arbejde er baseret paa Indsamlinger foretaget ved Færøerne paa de af "Kommissionen for Danmarks Fiskeri- og Havundersøgelser" foretagne Togter til det nordlige Atlanterhav i Tiden fra 1903 til 1939.

Alle Indsamlingerne stammer fra Sommerhalvaaret, de tidligste er fra Slutningen af Marts, de seneste fra Midten af September. Materialet bestaar af 1) pelagisk Sejyngel fanget i Ringtrawl i Færøernes Fjorde og i Farvandet omkring Øerne, 2) Smaasej af de 3 yngste Aarsgrupper fanget i Aalehaandvod i Fjordene og 3) ældre Sej fanget paa Line eller i Trawl paa Kystbankerne. Medens Materialet af Yngel og Smaasej omfatter et meget stort Antal Prøver og Individer, er Materialet af ældre Sej meget sparsomt.

1. Gydningen.

Sejens Gydning foregaar hovedsagelig paa Kystbankerne mellem 100 og 200 m Kurven. Den begynder ved Norge og Skotland i Januar og ved Island i Slutningen af Februar. En sikker Paavisning af Tidspunktet for Gydningens Begyndelse ved Færøerne savnes. Paa Grundlag af Yngelens Størrelsessammensætning i Prøver indsamlet i Marts og April 1935 og April, Maj og Juni 1934 maa man antage, at Sejens Gydning ved Færøerne begynder i Februar, kulminerer omkring 1. April og slutter i Begyndelsen af Maj.

2. Den pelagiske Yngels Fordeling i Færøomraadet.

I Slutningen af April og Begyndelsen af Maj, hvor saa godt som alle Æggene er klækket, er Yngelen talrigst. Den aftager stærkt i Antal i Løbet af Maj. I Løbet af Juni indvandrer Flertallet til Fjordene og i Begyndelsen af Juli forsvinder de sidste pelagiske Sejunger fra Bankerne. Allerede i Begyndelsen af April findes Yngel overalt paa Bankerne og inde mellem Øerne. Den mangler kun i de inderste Dele af Fjordene, hvor Tidevandsstrømmen ikke foraarsager en hurtig Udskiftning af Vandet. Inden for 100 m Kurven er Yngelen mindre talrig og Gennem-

snitsstørrelsen højere end mellem 100 og 200 m Kurven, hvor de yngste Larver udgør en højere Procentdel af Antallet. I Løbet af April og Begyndelsen af Maj udvisker de kraftige Tidevandsstrømme næsten helt denne Forskel. I Slutningen af Maj og Begyndelsen af Juni findes Yngelen omtrent lige hyppigt udenfor og indenfor 100 m Kurven, men Forskellen i Størrelse viser sig atter, efterhaanden som de større Sejunger begynder at indvandre til Fjordene. De iagttagne Forskelle i Antal og Størrelse er imidlertid ret smaa, og det mest iøjnefaldende ved Yngelens Fordeling er den hurtige og næsten fuldstændige Sammenblanding og Udjævning af Forholdene, der paa Grund af de kraftige Tidevandsstrømme er saa karakteristisk for de færøske Farvande.

Udenfor Kystbankerne forekommer Sejyngel i smaa Antal. Paa Færøbanke og muligvis ogsaa paa de vestlige Banker finder spredt Gydning Sted. Denne begynder antagelig lidt tidligere paa Aaret end inde ved Oerne. Yngelen paa disse Banker spredes antagelig af Overfladestrømmen dels mod N.V., hvor enkelte Unger er iagttaget over Dybet mellem Færøerne og Island syd for Færø-Island Ryggen, dels mod N.Ø. med den anticykloniske Drift omkring Færøerne og endelig mod Sydøst ind i Færø-Shetland Kanalen. I Farvandet nord for Færø-Island Ryggen findes Yngelen ikke, men fra den østlige Del af Færøernes Kystbanker sker der en mindre Drift af Yngel mod Sydøst ind i Færø-Shetland Kanalen. Strømmen, der gaar mod Nord langs de britiske Øers Vestkyst, fører antagelig lidt Sejyngel med sig fra Gydepladserne her. Hovedstrømmen følger Færø-Shetland Kanalen, men en mindre Gren bøjer mod Nord langs Færøbanke og Færøernes Vestkyst, og det er derfor sandsynligt at Færøomraadet af denne Vej faar tilført enkelte Sejunger fra fremmede Gydepladser. Sejyngelen i Færø-Shetland Kanalen driver dels ind over Kystbankerne ved Shetland- og Orkneyøerne dels ind i den nordlige Nordsø, og det er endog muligt, at enkelte naar den norske Kyst. Man maa derfor antage at enkelte Sejunger fra Gydepladserne ved Færøerne vokser op i disse fremmede Omraader.

3. Den pelagiske Yngels Vertikalfordeling.

Ifølge Schmidt (1909 p. 32) finder man som Regel de yngste pelagiske Sejunger nærmest ved Overfladen og de ældre lidt dybere. Hver pelagisk Station i det foreliggende Materiale omfatter som Regel et Ringtrawltræk i Overfladen (med 10 eller 15 m Wire) og et lidt dybere, antagelig fra 10—30 m under Overfladen (med 40 eller 65 m Wire). Ved at sammenligne Sejyngelens Størrelsessammensætning og Antal i disse Træk fra samme Lokalitet og Tidspunkt viser det sig, at saavel Gennemsnitsstørrelsen som Antallet lige saa ofte er størst i Overfladetrækket som i det dybere Træk. Der er hyppigt ret stor Forskel paa Antallet og Størrelsessammensætningen i Trækkene fra samme Station, men gennemsnitlig er Sejungerne lige talrige og lige store i Overfladen og de lidt dybere Vandlag.

De færøske Farvandes Hydrografi er karakteristisk ved, at Temperatur og Saltholdighed inde over Plateauet næsten altid er ens fra Bund til Overflade paa Grund af den stærke vertikale Opblanding som Tidevandsstrømmene foraarsager. Naar den af Schmidt paaviste Vertikalfordeling ikke kan konstateres her, maa man derfor antage, at denne er betinget af de i andre Farvande almindeligt forekommende højere Temperaturer og lavere Saltholdigheder i de øverste Vandlag.

Ved Sammenligning af Dag- og Nat-Træk fandtes en lige saa tilfældig Variation. Ingen af Prøverne tyder paa, at Sejyngelen foretager vertikale Døgnvandringer.

4. Yngelens Indvandring til Fjordene.

Den pelagiske Sejyngels største Individer begynder antagelig først i Maj at søge ind mod Kysterne. Efterhaanden som de af Strømmen føres ind mod Land, kommer de ind i Kyst-

strømmene og Fjordene. Skiftende Vind- og Strømforhold kan antagelig foraarsage, at Yngelen ankommer i mere eller mindre afgrænsede Perioder, hvorved de opvoksende Bundstadier undertiden fordeler sig i 2 eller flere tydelige Størrelsesgrupper.

De første Bundstadier, der er mellem 2,5 og 3,5 cm lange, viser sig i Aalehaandvodstræk i Yderkystfjordene omkring 1. Juni, medens de indre dybe Fjorde først naas noget senere. I Slutningen af Maj og Begyndelsen af Juni findes Yngelen sparsomt baade ved Indsamlinger med Aalehaandvod og Ringtrawl, da den paa dette Tidspunkt antagelig findes talrigst halvpelagisk tæt under Land.

I sidste Halvdel af Juni og Begyndelsen af Juli tiltager Mængden af Sejunger meget stærkt paa lavt Vand i Fjordene, samtidig med at de sidste pelagiske Efternølere forlader Kystbankerne. Endnu i Midten af Juli maa man antage, at en stor Del af Aarsyngelen opholder sig halvpelagisk tæt ved Kysterne, og Individantallet pr. Aalehaandvodstræk stiger derfor stadig indtil Slutningen af Juli, hvor de sidste Unger er naaet ind i det rolige Vand i Fjordenes Kystomraader.

5. Reduktionen af Bestanden i Fjordene og Udvandringen fra disse.

Naar Indvandringen er afsluttet i Slutningen af Juli, er Aarsyngelen fra hele Færøområdet samlet langs Bredderne af Sundene og Fjordene, og Antallet pr. Aalehaandvodstræk kulminerer. Allerede i Løbet af den følgende Maaned reduceres 0-Gruppe Bestanden til omtrent det halve, først og fremmest som Følge af Fugle og Fisks Angreb.

I Løbet af Vinterhalvaaret falder Antallet pr. Træk ca. 25 %, altsaa med væsentlig nedsat Hastighed, men i den anden Sommer aftager Antallet atter hurtigt. Sej af II-Gruppen forekommer kun sjældent i Aalehaandvodstrækkene. Størstedelen af de unge Sej forlader med andre Ord det lave Vand ved Fjordbredderne som eetaarige. Derefter fører de en pelagisk Tilværelse i omstrejfende Stimer paa Jagt efter Føde i Fjordene eller ude over Kystbankerne. Det er sandsynligt, at de faa 2- og 3-aarige Sej, der er fanget i Aalehaandvod er mere eller mindre tilfældige Gæster fra saadanne.

6. Den gennemsnitlige Vækst.

Den i Fig. 9 viste Vækstkurve er opbygget paa Grundlag af Maalinger af ca. 7 Tusinde pelagiske Sejunger og ca. 50 Tusinde Smaasej fra Aalehaandvodstræk. Den viser med nogle enkelte Forbehold Sejens gennemsnitlige Vækst i dens 3 første Leveaar.

Der foreligger som nævnt kun et meget lille Materiale af Trawl- og Line-fangede ældre Sej, kun 61 Skælprøver er indsamlet, omfattende 2—10 Aar gamle Individer. De enkelte Aarsgrupper er saa sparsomt repræsenteret, at disses Gennemsnitslængde kun kan give et meget groft Skøn over Væksten. Hvis man antager, at Sejens Skæl tilnærmelsesvis vokser ligefrem proportionalt med Dyrets Længde, kan man ved at maale Afstanden fra Skælcentret til hver Vækstzones yderste Begrænsning ud fra Sejens totale Længde beregne de Længder, den havde ved hver Vækstperiodes Afslutning. Resultatet af denne Beregning er vist i Fig. 10.

Ved at aflæse paa disse beregnede Vækstkurver ser man, at Sejens Vækstforløb i Hovedtrækkene er følgende: I Løbet af de knapt 3 Mdr. Sejungen lever pelagisk, opnaar den en Størrelse paa ca. 30 mm. Saasnart den er naaet ind paa lavt Vand i Fjordene stiger Vækshastigheden stærkt. Midt paa Sommeren aftager denne en kort Periode, og Væksten er atter i fuld Gang i Begyndelsen af September, hvor Gennemsnitslængden er 10 cm. Observationer for Resten af Aaret savnes. Ifølge Skælanalyserne er Sejen gennemsnitlig ca. 13 cm ved Afslutningen af første Vækstperiode. De tidligste Fangster af eetaarige Sej stammer fra Slutningen

af April, Gennemsnitslængden er da 15,5 cm og stiger hurtigt i Løbet af Sommeren og naar 25 cm i første Halvdel af September. Ifølge Skælanalyserne er Gennemsnitslængden ved 2. Vækstperiodes Slutning godt 26 cm. De toaarige Sej, der fanges i Fjordene er i April—Maj gennemsnitlig ca. 29 cm og vokser i Løbet af Sommeren til ca. 39 cm i Begyndelsen af September. Ved Skælanalyserne fandtes omtrent samme Længder ved Vækstperiodens Slutning.

De 3 første Aarsgrupper vokser altsaa gennemsnitlig 2 cm pr. Maaned i de undersøgte 5 Maaneder af Sommerhalvaaret. I de mellemliggende 7 Maaneder er den maanedlige Gennemsnitsvækst kun lidt over $^1/_2$ cm. Den aarlige Vækst er i disse 3 Aar næsten ens, nemlig ca. 13 cm. Ifølge Skælanalyserne aftager den aarlige gennemsnitlige Tilvækst langsomt i de følgende Aar, til ca. 11 cm i Løbet af den sjette og til 7,5 cm i den syvende Vækstperiode, ved hvis Slutning Gennemsnitslængden er ca. 80 cm. Endelig er den gennemsnitlige aarlige Tilvækst for de undersøgte 7 til 10 Aar gamle Individer ca. 5 cm. De foreliggende 3 tiaarige Sej er gennemsnitlig 91 cm lange.

Som paavist af Damas (1909) aftager de 3 yngste Sejaarganges Væksthastighed langs Norges Kyst fra Syd mod Nord. Ved Sammenligning med de af Damas nævnte Exempler (S. 31) ses det, at Sejens Opvækst i de færøske Fjorde sker med samme Hastighed som i de norske Fjorde paa samme Breddegrader.

Sammenligner man den beregnede Vækstkurve for de ældre Sej med tilsvarende Vækstkurver fra Romsdal i Norge og N.V. Island (Fig. 11), ser man, at Væksthastigheden i de 3—4 første Aar er næsten identisk. I det følgende Afsnit forløber den færøske Kurve mellem de to andre. Naar Sejen har afsluttet Opvæksten i Fjordene vokser den altsaa hurtigere ved Færøerne end ved Norge, men naar dog ikke helt Væksthastigheden ved N.V. Island.

7. Vækstens Variation.

Naar man opdeler alle de foreliggende Prøver af 0-Gr. Sej i Grupper efter de Tidspunkter af Aaret, de er indsamlet og beregner Variantgrænserne for 0, 5, 25, 50, 75, 95 og 100 % af Individerne i hver af disse Grupper, kan man konstruere et Diagram (Fig. 13), der med enkelte Forbehold er et Udtryk for Aarsyngelens Størrelsessammensætning og dennes Ændring i Løbet af første Sommerhalvaar.

Den midterste Kurve angiver de Værdier, som 50 % af Individerne er større end. Den er i det foreliggende Materiale næsten identisk med den før omtalte Gennemsnitsvækstkurve. De nærmeste 2 Kurver, der begrænser det dobbelt skraverede Felt, angiver Værdierne som henholdsvis 25 og 75 % af Individerne er større end. 50 % af de undersøgte Sej har altsaa Længder, der falder indenfor dette Felt. De næstyderste 2 Kurver angiver paa samme Maade de Længder, som henholdsvis 5 og 95 % af Individerne overskrider, og hele det skraverede Felt rummer altsaa 90 % af disse. Endelig angiver de yderste Kurver Grænsen for Variationen i det foreliggende Materiale. Kun 5 % af de undersøgte Sej har altsaa Længder, der falder indenfor det øverste uskraverede Felt, og tilsvarende rummer det nederste uskraverede Felt de 5 % som er mindst. Tabel 13 viser tilsvarende I-Gruppens Variantgrænser og Variationsbredder. Man ser, at 0-Gruppens hurtigst voksende Individer har en Væksthastighed, der er ca. dobbelt saa stor som Gennemsnittets. De indvandrer til Fjordene i Slutningen af Maj og bliver inden Udgangen af denne Maaned 5 cm lange og naar i Begyndelsen af September 20 cm Længde. Aargangens mindste Individer klækkes efter Midten af Maj, naar først Fjordbredderne i Juli og er knapt 4 cm i Begyndelsen af September.

Spredningen i Sejens Størrelsessammensætning stiger stærkt i Løbet af den første Sommer. Den naar et Maximum i Efteraaret og falder lidt i Løbet af Vinterhalvaaret for derefter

atter at stige i den følgende Sommer. Den relative Spredning d. v. s. Variationsbredderne i Forhold til Gennemsnitsstørrelsen holder sig omtrent konstant i den pelagiske Periode, stiger lidt under Indvandringen til Fjordene og holder sig atter ret uændret indtil Efteraaret. I Løbet af Vinterhalvaaret falder den, og er i den følgende Sommer, hvor den atter holder sig omtrent konstant, knapt halvt saa stor som i den første Vækstperiode.

Ved Sammenligning af Størrelsessammensætningen i de Prøver af Sejens to første Aarsgrupper, der i Aarenes Løb er indsamlet paa forskellige Lokaliteter i de færøske Fjorde, kan man paavise følgende Regler for Størrelsessammensætningens Variation udtrykt ved Aarsgruppernes Gennemsnitslængder:

1. Gennemsnitslængderne er ens i samtidige Prøver fra samme Lokalitet. Aarsgrupperne er altsaa ikke lokalt opdelt i Smaastimer med forskellig Størrelsessammensætning.

2. 0-Gruppens Gennemsnitslængde er i samtidige Prøver større ved Fjordbunden end nærmere ved Mundingen. Forskellen skyldes hovedsagelig at Aargangens største Individer fortrinsvis opsøger Fjordbunden.

3. Aarsgruppernes Gennemsnitslængde i samtidige Prøver er større ved Hvalfangerstationerne end andre Steder i samme Fjord. Forskellen skyldes antagelig bedre Vækstbetingelser i Hvalfangerstationernes Nærhed, hvor Affaldet fra disse frembringer en rig Opvækst bl. a. af Tanglopper, der er et af Smaasejenes vigtigste Fødeemner.

4. Aarsgruppernes Gennemsnitslængde er paa samme Tidspunkter forskellige i de forskellige Fjorde. 0-Gruppens Gennemsnitslængde er i Forhold til Tidspunktet særlig store i Skaale Fjord, Kollefjord og ved Thorshavn, og særlig smaa i Fuglefjord og Funding Fjord. Forskellen skyldes antagelig forskellige Vækstbetingelser i Sommermaanederne som Følge af lokale Forhold i de forskellige Fjorde. I-Gruppens Gennemsnitslængder er i Forhold til Tidspunktet særlig store i Vaag Fjord, Fuglefjord og ved Thorshavn og særlig smaa i Skaale Fjord og Kollefjord. Forskellen skyldes antagelig, at Vækstbetingelserne i Vinterhalvaaret er bedre i de førstnævnte end i de sidstnævnte Fjorde.

5. Aarsgruppernes Gennemsnitslængder er paa samme Lokaliteter og Tidspunkter af Aaret forskellig i de forskellige Aar. 0-Gruppens Gennemsnitslængder var i Forhold til Lokaliteterne og Tidspunktet af Aaret store i 1927, 1931 og 1932 og smaa i 1924, 1925, 1933 og 1938. Forskellen skyldes muligvis Temperaturforholdene i første Halvdel af Sommeren de paagældende Aar. I-Gruppens Gennemsnitslængder var i Forhold til Lokaliteterne og Tidspunktet af Aaret særlig høje i Somrene 1926, 1932 og 1934, og særlig lave i Somrene 1924, 1927 og 1931. Forskellene skyldes, at Vintrene, der gik forud for de 3 førstnævnte Somre, var særlig korte og milde, medens det modsatte var Tilfældet i de 3 sidstnævnte Aar.

6. Aarsgruppernes Gennemsnitslængder er nøje overensstemmende i de to Tærskelfjorde, Skaale Fjord og Kollefjord.

8. 0- og I-Gruppens kvantitative Fordeling i Fjordene og Fluktuationer i Aargangenes Størrelse.

En Sammenligning af de Antal af 0- og I-Gruppe Sej, der er opnaaet pr. Aalehaandvodstræk paa de forskellige Lokaliteter og i de forskellige Aar (Tabel 18 og 19) viser, at Variationen er meget stor og i mange Tilfælde ret tilfældig, da Redskabets Effektivitet paavirkes af flere ukontrollable Faktorer.

Prøverne tyder dog paa, at 0-Gruppen gennemgaaende er talrigst paa de undersøgte Lokaliteter i Vestmannhavn, Fuglefjord og Vaag Fjord, noget mindre talrig paa Lokaliteterne i Klaksvig, Trangisvaag Fjord, Kalbaks Fjord og ved Thorshavn og særlig faatallig paa Lo-

kaliteterne i Skaale Fjord, Kollefjord og Kvalvig. I-Gruppen synes talrigst i Vaag Fjord, Fuglefjord, Skaale Fjord og Trangisvaag Fjord.

0-Gruppen var i 6 af de 15 undersøgte Aar, nemlig i 1903, 1911, 1912, 1933, 1938 og 1939, væsentlig talrigere end i de øvrige Aar paa næsten alle de undersøgte Lokaliteter. I 1904 og 1913 var I-Gruppen i Overensstemmelse hermed særlig talrig, men dette synes ikke at have været Tilfældet i 1912, 1934 og 1939. For at følge Fluktuationerne i Sej Aargangenes Størrelse kræves med andre Ord et baade større og mere ensartet indsamlet Materiale. Der er saaledes ringe Haab om ad denne Vej at følge Svingningerne i Sej-Bestanden.

9. Sejens Føde.

Der er foretaget et mindre Antal Maveindholdsanalyser af pelagiske Sejunger fra 5 til 35 mm Længde. Disse indeholdt fortrinsvis Rester af smaa Krebsdyr (Copepoder, Daphnier og Krabbelarver). Desuden forekom Fiskeæg i flere af Maveindholdene.

Tabel 21—30 viser Resultatet af Maveindholdsanalyser af en Række Prøver af 0- og I-Gruppe Sej, fra forskellige færøske Fjorde. De iagttagne Fødeemner kan deles i 2 Grupper: 1) Pelagiske Former fra Fjordene og de omgivende Farvandes frie Vandmasser. 2) Fritsvømmende, krybende eller fastsiddende Former fra Vegetationsbæltet. Udprægede Bundformer er kun iagttaget i nogle enkelte Undtagelsestilfælde.

Den første Gruppe omfatter pelagiske Krebsdyr, Bunddyrlarver og Fiskeæg. Blandt Krebsdyrene er Copepoderne af overvejende Betydning som Fødeemne. Desuden forekommer Larver af Rurer og Krabber og i enkelte Tilfælde Lyskrebs. Pelagiske Unger af Muslinger (Blaamuslinger) og Snegle er kun iagttaget i en af Prøverne. Fiskeæg fortrinsvis af Rødtunge indgaar meget hyppigt i Maveindholdene, men i de fleste Tilfælde kun i meget smaa Antal. I en af Prøverne fandtes dog i flere Tilfælde 3—400 Æg i et Maveindhold og i en anden indeholdt hvert af de undersøgte Individer mellem 1 og 2 Tusinde Æg. Disse udprægede Planktonformer spiller særlig en Rolle for 0-Gruppens mindste Individer, men udgør, naar det dyriske Planktonet er særlig rigt, Hovedparten af alle Smaasejenes Føde.

Blandt den Fauna, der er knyttet til Alge-Vegetationen finder Smaasejene som Regel sine vigtigste Fødeemner. Særlig hyppigt og i særlig store Mængder forekommer forskellige Tanglopper (Lysianassider, *Gammarus*, Podocerider, Caprellider etc.) i Maveindholdene. Af andre Krebsdyr fra Vegetationsbæltet kan nævnes Muslingekrebs, Kaarer og Tanglus (Idothea o. a.) der i større eller mindre Antal findes i næsten alle Prøverne. I en af disse udgjorde Myggelarver (Chironomider af *Chricotopus halophilus* Gr.) i mange Individer over Halvdelen af Maveindholdet. I de øvrige Prøver findes Myggelarver kun i mindre Mængder. Smaa Snegle (*Lacuna divaricata, Rissoa interrupta* o. a.) og Unger af Blaamuslingen optræder ret hyppigt men i Reglen kun i smaa Antal. Desuden forekommer en Del af Vegetationsbæltets fritlevende Børsteorme (Nereider, Phyllodocider o. a.) af og til.

Næst efter Tanglopper er Sejens mindre Artsfæller det Fødeemne, der oftest dominerer i de undersøgte Maveindhold. Det synes dog kun at være de mindste 3—4 cm lange nylig indvandrede Aarsunger, der er udsat for de større Artsfællers Forfølgelse. En af Prøverne viser, at allerede fra 9 cm Størrelse deltager 0-Gr. Sejene i Jagten paa deres egen Aargangs mindste Individer. Da Smaasejene forekommer langt talrigere end nogen anden Fiskeart i Vegetationsbæltet, maa man i denne Kannibalisme søge den vigtigste Aarsag til den tidligere omtalte voldsomme Reduktion af Aarsyngelens Mængde i Løbet af den første Maaned, den opholder sig i Fjordene. Andre Fiskerester er kun fundet i enkelte Tilfælde ved den foreliggende Under-

søgelse, men Schmidt (1904 p. 83) har iagttaget Smaasej, hvis Maver var fyldt med Unger af Sild, Tobis og Torsk.

De foreliggende Prøver tyder paa, at Sammensætningen af Sejens Føde i de færøske Fjorde veksler hyppigt i Aarets Løb. I forskellige Sæsoner er forskellige Fødeemner dominerende. I de Perioder, hvor Smaasejene fortrinsvis er henvist til Vegetationsbæltets Krebsdyr og Bløddyr optræder en ret udpræget Specialisering, saaledes at man i lige store Individer fra samme Prøve finder meget forskellige Maveindhold. En har f. Eks. næsten udelukkende Tanglopper af en bestemt Art i Maven, en anden har næsten udelukkende ædt en anden Art af samme Krebsdyr Orden, en tredie har specialiseret sig i at jage Tanglus o. s. v.

Nøjere Undersøgelser af de ældre Sejs Føde paa Kystbankerne ved Færøerne savnes. I nogle enkelte Sej paa omkring 90 cm Længde fra Farvandet N.O. for Oerne fandtes ifølge Journalen: Lyskrebs, Blæksprutter, Sild og Laksesild (Scopeliner).

APPENDIX

Tables I—X.

Length frequencies and average lengths of the age groups of the coalfish in all eel hand seine collections from the Faroes 1903—1939.

(The limits between the age groups are marked with a heavy line (—). Average lengths of less than 10 specimens in brackets.)

Table I. $^{16}/_{4}$—$^{30}/_{4}$.

Year	1910		1934						$^{16}/_{4}$—$^{30}/_{4}$ Total	
Date	$^{28}/_{4}$	$^{29}/_{4}$	$^{23}/_{4}$	$^{24}/_{4}$	$^{26}/_{4}$	$^{26}/_{4}$	$^{26}/_{4}$	$^{30}/_{4}$		
Station	..	..	5029	5036	5042	5043	5045	5058		
Locality	Vaag	Lopra	Klaksvig	Skaale Fjord	Sundene	Sundene	Fuglefjord	Kollefjord		
No. of hauls	3	3	7	5	2	10	9	9	48	
cm									I-gr.	II-gr.
46	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..
44	..	..	.	..	..	.	..	..	.	..
43	.	.	.	..	.	..	..	..	..	..
42	.	.	.	.	.	..	..	..	..	..
41	..	..	.	..	..	..	..	..	..	..
40	..		..	.	.	.	.	..	..	..
39	..	..	..	.	..	..	..	..	..	..
38	..	..	.	..	.	..	..	..	..	..
37	..	..		.		..	..	..	..	..
36	..	..	..	..	.	..	.	..	..	..
35	..		..	..	..	..	..	..	..	..
34	..	.	.		.	..	.	..	..	..
33	.	..	2	.	.	..	.	..	.	2
32	.	..	..	..	.	..	..	..	..	.
31	1	1	..	..	..	.	.	..	..	2
30	3	1	..	..	..	..	.	..	.	4
29	3	.	..	.	..	1	..	.	..	4
28	3	1	..	.	.	2	..	.	..	6
27	3	..	1	..	..	1	..	.	..	5
26	3	—	..	.	..	..	.	.	..	3
25	—	1	..	.	..	2	..	..	1	2
24	2	..	—	.	.	—	..	.	2	..
23	1	1	.	.	..	2	..	..	4	..
22	2	1	.	..	..	1	3	..	7	..
21	4	.	3	5	..	1	5	.	18	..
20	2	1	1	7	.	2	1	.	14	..
19	6	6	2	24	.	2	5	1	46	.
18	22	8	.	42	..	2	19	.	93	.
17	46	21	3	45	.	7	32	.	154	.
16	70	25	6	33	.	12	19	.	195	.
15	92	37	9	5	.	9	83	1	237	.
14	89	39	10	1	1	4	80	.	224	.
13	82	23	6	.	.	2	59	.	172	.
12	56	14	8	.	.	..	20	2	100	.
11	25	3	7	..	.	..	13	.	48	.
10	14	..	2	..	.	.	1	..	17	.
9	..	.	..	.	.	.	1	.	1	.
8	.	..	..	.	.	..	.	..	..	..
7	..	.	..	.	.	.	..	.	.	.
6	.	.	.	..	.	.	.	.	.	.
5	..	.	..	.	.	.	.	.	.	.
4	.	.	..	.	.	..	.	.	..	..
3	.	.	.	..	.	..	..	..	.	.
2	..	..	.	.	.	.	.	.	.	.
I-gr. No. of specimens	513	181	57	162	1	44	371	4	1333	..
Average length	*15,0*	*15,5*	*11,8*	*18,0*	*(11,5)*	*17,1*	*15,3*	*(15,0)*	*15,58*	.
II-gr. No. of specimens	16	3	3	0	0	6	0	0	..	28
Average length	*28,7*	*(30,2)*	*(31,5)*	.	..	*(27,5)*	..	..	..	*28,89*
Total No.	529	184	60	162	1	50	371	4	1361	

Table II. $^{1}/_{5}$—$^{15}/_{5}$.

Year	1904	1910			1912		1934		$^{1}/_{5}$—$^{15}/_{5}$ Total	
Date	$^{13}/_{5}$	$^{6}/_{5}$	$^{9}/_{5}$	$^{9}/_{5}$	$^{11}/_{5}$	$^{15}/_{5}$	$^{1\,2}/_{5}$	$^{3}/_{5}$		
Station	79	..	..	..	1—2	3	5063	5069		
Locality	Trangisvaag	Vaag	Vaag	Vaag	Thorshavn	Ørdevig	Vaag	Ørdevig		
No. of hauls	5	3	2	2	5	3	12	9	41	
cm									I-gr.	II-gr.
46	.	.								.
45	.	.		.		.	.			
44	..	.		.						
43	.	.	.	.						
42	.	.								
41	.									
40	.	.								
39	.									
38	.									
37	.			.						
36	.			.						
35	.						1			1
34	.						1			1
33	.	.					1			1
32	..	..			2		1	1		4
31	.				1		4			5
30	1	.	1		1		2			5
29	1	.	2		2		1			6
28	1	2	2	1			1			6
27	1	1	1	1						4
26	2			1			2			5
25	.	.			.		2			2
24	—	—	—	—	—	—	—	—		
23	..	.		1			3		4	
22	1	1	1	1			1		3	
21	1	2	1	1			2		7	
20	.	12	1	2	1		2		18	
19	1	26	3	14			5		49	
18	7	38	14	50	3	..	3		115	
17	15	142	20	79	3	..	10		259	
16	51	216	21	89	3	..	22	.	402	
15	132	226	9	82	3	..	20	1	473	.
14	241	168	9	41	2		25		476	
13	241	54	4	23	1		28		321	
12	145	14	1	4			19		183	
11	28	2		4			6		35	
10	3		2	1					6	
9	.	.								
8	.							.		
7	.									.
6							.			
5	.			.						
4	.	.		.						
3	.									
2	.	.								.
I-gr. No. of specimens	830	880	86	392	16	0	146	1	2351	
Average length	*11,2*	*16,0*	*16,7*	*16,4*	*16,7*	..	*15,2*	*(15,5)*	*15,42*	.
II-gr. No. of specimens	5	3	6	3	6	0	16	1	.	40
Average length	*(28,1)*	*(28,2)*	*(29,0)*	*(27,5)*	*(31,0)*	.	*30,3*	*(32,5)*	.	*29,63*
Total No.	835	883	92	395	22	0	162	2	2391	

Table III. $^{16}/_{5}$—$^{31}/_{5}$.

Year	1904		1913		1924					1925				1926					1934	$^{16}/_{5}$—$^{31}/_{5}$ Total		
Date	$^{17}/_{5}$	$^{21}/_{5}$	$^{16}/_{5}$	$^{28}/_{5}$	$^{23}/_{5}$	$^{26}/_{5}$	$^{28}/_{5}$	$^{30}/_{5}$	$^{31}/_{5}$	$^{20}/_{5}$	$^{22}/_{5}$	$^{24}/_{5}$	$^{20}/_{5}$	$^{26}/_{5}$	$^{26}/_{5}$	$^{27}/_{5}$	$^{28}/_{5}$	$^{31}/_{5}$	$^{28}/_{5}$			
Station	94	98	2	7	2062	2073	2077	2080	2082	2280	2293	2297	2286	2528	2535	2540	2545	2551	5165			
Locality	Vaag	Vestmanhavn	Trangisvaag	Trangisvaag	Vaag	Trangisvaag	Vestmanhavn	Fuglefjord	Kollefjord	Kollefjord	Vaag	Fuglefjord	Skaale Fjord	Skaale Fjord	Kollefjord	Kvalvig	Skaale Fjord	Trangisvaag	Vaag			
No. of hauls	8	2	3	6	6	3	2	7	4	4	7	6	2	3	3	4	2	5	9	86		
cm																				0-gr.	I-gr.	II-gr.
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
39	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
36	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
34	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	**1**
33	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**1**
32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**1**
29	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**2**
28	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**2**
27	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**1**
26	..	..	..	2	..	..	..	1	..	..	—	..	—	..	..	..	..	—	..	..	..	**3**
25	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	..	—	..	..	..	—	..	..	1	..	1	..	..	..	..	..	..	..	**2**	..
23	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	**2**	..
22	..	..	..	7	1	..	..	..	1	..	..	..	1	..	..	..	..	..	1	..	**11**	..
21	..	..	..	3	3	..	..	..	..	..	4	..	..	..	..	..	1	1	1	..	**13**	..
20	..	..	..	3	10	..	..	..	..	..	10	..	..	1	..	..	3	2	..	..	**29**	..
19	..	..	..	17	41	1	..	..	1	2	7	..	..	1	..	..	2	6	2	..	**80**	..
18	2	3	4	8	80	..	1	2	2	..	14	1	..	12	..	2	7	9	4	..	**151**	..
17	23	5	6	16	149	2	..	..	3	3	28	1	3	16	..	3	4	36	6[2]	..	**304**	..
16	39	15	28	19	291	9	3	2	7	9	23	2	4	25	..	2	19	34	6	..	**537**	..
15	69	24	143	43	433	27	..	..	18	9	11	4	7	10	..	4	11	21	8	..	**842**	..
14	95	25	151	35	320	21	6	..	32	7	8	..	5	2	..	3	1	7	4	..	**722**	..
13	76	16	57	11	107	3	5	..	12	9	1	1	8	..	..	..	1	1	1	..	**309**	..
12	39	4	6	1	27	3	1	..	3	1	2	..	1	..	..	..	..	1	..	..	**89**	..
11	10	1	..	..	1	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	**14**	..
10	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	**2**	..
9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7	..	—	..	..	—	—	—	—	..	..	..	..	..	..	..	..	..	—	—	..	..	..
6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	**1**	..	..
4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11	..	**11**	..	..
3	..	6	..	..	8	16	73	..	..	..	..	..	..	..	..	..	..	11	2	**116**	..	..
2	..	1	..	..	10	3	16	2	..	..	..	..	..	..	..	..	..	..	..	**32**	..	..
0-gr. No. of specimens	0	7	0	0	18	19	89	2	0	0	0	0	0	0	0	0	0	23	2	**160**	..	..
— Average length	..	*(3,4)*	..	..	*2,9*	*3,1*	*3,3*	*(2,9)*	..	..	..	..	..	..	..	..	..	*4,0*	*(3,6)*	*3,32*	..	..
I-gr. No. of specimens	354	93	395	163	1464	66	16	4	79	41	109	9	32	67	0	14	50	118	33	..	**3107**	..
— Average length	*14,8*	*15,1*	*14,9*	*16,5*	*15,8*	*15,2*	*14,7*	*(17,5)*	*15,1*	*15,8*	*17,5*	*(16,1)*	*15,2*	*16,5*	..	*16,3*	*17,1*	*16,8*	*16,9*	..	*15,69*	..
II-gr. No. of specimens	0	0	0	8	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	..	..	**11**
— Average length	..	..	..	*(28,9)*	..	..	..	*(26,5)*	..	..	*(29,5)*	..	..	..	..	..	..	*(34,5)*	..	..	..	*29,2*
Total No.	354	100	395	171	1482	85	105	7	79	41	110	9	32	67	0	14	50	142	35	**3278**		

Table IV. $^{1}/_{6}$—$^{15}/_{6}$.

Year	1912		1913	1926	$^{1}/_{6}$—$^{15}/_{6}$ Total		
Date	$^{4}/_{6}$	$^{15}/_{6}$	$^{2-5}/_{6}$	$^{31}/_{5}$—$^{2}/_{6}$			
Station	7	15	1013	2561			
Locality	Vestmanhavn	Vestmanhavn	Trangisvaag	Vaag			
No. of hauls	1	1	7	23	32		
cm					0-gr.	I-gr.	II-gr.
46	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..
39	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..
36	..	..	..	1	..	..	**1**
35	..	..	..	1	..	..	**1**
34	..	..	..	2	..	..	**2**
33	..	..	..	..	..	..	..
32	..	..	..	2	..	..	**2**
31	..	..	..	6	..	..	**6**
30	..	..	1	6	..	..	**7**
29	..	..	1	3	..	..	**4**
28	..	..	1	2	..	..	**3**
27	..	..	..	1	..	..	**1**
26	..	..	..	..	..	..	..
25	..	..	—	—	..	..	..
24	..	..	..	..	..	..	..
23	..	..	..	5	..	5	..
22	..	..	..	7	..	**7**	..
21	..	..	..	8	..	**8**	..
20	..	..	..	28	..	**28**	..
19	4	..	1	69	..	**74**	..
18	8	..	12	139	..	**159**	..
17	23	..	37	196	..	**256**	..
16	31	..	86	139	..	**256**	..
15	17	..	47	50	..	**114**	..
14	14	..	18	17	..	**49**	..
13	2	..	5	2	..	**9**	..
12	..	..	2	1	..	**3**	..
11	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..
8	..	..	—	—	..	..	..
7	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..
4	..	..	..	24	**24**	..	..
3	..	..	5	32	**37**	..	..
2	..	..	1	..	**1**	..	..
0-gr. No. of specimens	0	0	6	56	**62**	..	..
— Specimens not measured	0	0	0	0	**0**	..	..
— Average length	..	..	*(3,4)*	*3,9*	*3,88*	..	..
I-gr. No. of specimens	99	0	208	661	..	**968**	..
— Average length	*16,5*	..	*16,4*	*17,7*	..	*17,30*	..
II-gr. No. of specimens	0	0	3	24	..	..	**27**
— Average length	..	..	*(29,5)*	*31,3*	..	..	*31,1*
Total No.	99	0	217	741		**1057**	

Table V. $^{16}/_{6}$—$^{30}/_{6}$.

Year	1913			1927			1932					$^{16}/_{6}$—$^{30}/_{6}$ Total		
Date	$^{17}/_{6}$	$^{17-19}/_{6}$	$^{23}/_{6}$	$^{20-21}/_{6}$	$^{28}/_{6}$	$^{29}/_{6}$	$^{15-16}/_{6}$	$^{17}/_{6}$	$^{22}/_{6}$	$^{23}/_{6}$	$^{22}/_{6}$			
Station	53	54	59	3013	3042	3046	4379	4380	4389	4397	4398			
Locality	Vaag	Vaag	Thorshavn	Vaag	Kollefjord	Skaale Fjord	Vaag	Lopra	Skaale Fjord	Funding Fjord	Fuglefjord			
No. of hauls	1	2	3	26	10	15	18	8	15	3	4	105		
cm												0-gr.	I-gr.	II-gr.
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..
39	..	..	..	..	..	..	..	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..	..	..	..	..	..	..	..
36	..	..	..	..	..	..	..	..	..	..	..	..	..	..
35	..	..	..	..	..	..	..	..	1	..	..	..	..	1
34	..	..	..	..	..	..	..	..	..	..	..	..	..	..
33	..	..	3	..	..	..	1	..	..	..	..	..	..	**4**
32	..	..	..	1	..	1	..	..	..	..	..	..	..	**2**
31	..	..	1	..	..	..	..	..	..	..	..	..	..	**1**
30	..	..	..	..	..	2	..	..	..	..	..	..	..	**2**
29	..	..	—	..	..	..	..	..	..	..	..	..	..	..
28	..	..	1	..	..	1	..	..	..	..	..	..	**1**	**1**
27	..	..	1	..	..	..	..	..	..	..	4	..	**5**	..
26	..	2	..	—	..	—	—	..	—	..	3	..	**5**	..
25	..	4	1	1	..	..	..	..	..	..	10	..	**16**	..
24	1	5	1	4	..	..	2	1	1	..	30	..	**45**	..
23	4	12	4	2	..	..	1	..	2	..	38	..	**63**	..
22	3	19	1	11	..	..	2	1	5	..	52	..	**94**	..
21	11	31	1	9	..	..	5	1	12	..	68	..	**138**	..
20	21	73	1	24	..	..	14	3	42	..	83	..	**261**	..
19	46	68	1	56	..	..	26	1	53	..	89	..	**340**	..
18	45	103	..	82	5	6	29	..	44	..	70	..	**384**	..
17	38	49	..	83	16	20	61	..	19	..	51	..	**337**	..
16	14	18	..	56	61	45	31	..	8	..	9	..	**242**	..
15	9	9	..	23	56	66	17	..	..	..	6	..	**186**	..
14	3	5	..	4	52	52	13	..	..	..	1	..	**130**	..
13	..	1	..	4	11	17	2	..	..	..	..	..	**35**	..
12	..	..	..	..	1	2	1	..	..	..	—	..	**4**	..
11	..	..	..	..	..	..	..	..	..	..	2	**2**	..	..
10	..	..	—	—	..	..	—	—	—	..	14	**14**	..	..
9	..	..	..	5	..	..	6	3	..	..	29	**43**	..	..
8	..	..	..	48	..	..	40	3	..	..	14	**105**	..	..
7	..	..	..	45	..	..	74	2	..	..	28	**149**	..	..
6	..	..	1	4	..	..	102	..	..	2	60	**169**	..	..
5	..	..	15	6	..	..	238	..	2	10	95	**366**	..	..
4	..	..	12	2	..	..	205	1	11	5	190	**426**	..	..
3	..	..	6	..	..	..	72	..	8	5	599	**690**	..	..
2	..	..	..	..	..	..	8	..	..	..	125	**133**	..	..
0-gr. No. of specimens	0	0	34	110	202	0	745	9	21	22	1156	**2097**	..	..
— Specimens not measured	0	0	0	0	0	0	6425	0	0	0	717	**7142**	..	..
— Average length	..	..	*4,8*	*7,9*	*15,7*	..	*5,5*	*(8,2)*	*4,3*	*4,9*	*4,3*	*4,94*	..	..
I-gr. No. of specimens	195	399	12	359	0	208	204	7	186	0	514	..	**2286**	..
— Average length	*18,8*	*19,5*	*23,7*	*18,3*	..	*15,5*	*17,8*	*(21,8)*	*19,4*	..	*20,6*	..	*18,65*	..
II-gr. No. of specimens	0	0	4	1	0	4	1	0	1	0	0	..	..	**11**
— Average length	..	..	*(33,0)*	*(32,5)*	..	*(30,5)*	*(33,5)*	..	*(35,5)*	..	..	..	..	*32,3*
Total No.	195	399	50	470	202	212	7375	16	208	22	2387		**11536**	

Table VI. $^{1}/_{7}$—$^{15}/_{7}$.

Year	1912		1934			$^{1}/_{7}$—$^{15}/_{7}$ Total	
Date	$^{12}/_{7}$	$^{13}/_{7}$	$^{6}/_{7}$	$^{7}/_{7}$	$^{9-10}/_{7}$		
Station	17	18	5262	5269	5283		
Locality	Vestmanhavn	Vestmanhavn	Sandsvaag	Vaag	Klaksvig		
No. of hauls	5	4	1	7	11	28	
cm						0-gr.	I-gr.
46	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..
39	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..
36	..	..	..	..	..	..	..
35	..	..	..	..	..	..	..
34	..	..	..	..	..	..	..
33	..	..	..	..	..	..	..
32	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..
29	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..
24	..	..	..	3	..	..	**3**
23	..	..	..	1	..	..	**1**
22	..	..	..	3	..	..	**3**
21	..	..	..	6	1	..	**7**
20	..	..	..	5	..	..	**5**
19	..	..	..	2	..	..	**2**
18	..	..	..	1	1	..	**2**
17	..	..	..	..	1	..	**1**
16	..	..	..	..	4	..	**4**
15	..	..	..	..	1	..	**1**
14	..	..	..	..	1	..	**1**
13	..	..	..	..	..	..	..
12	1	3	..	—	—	**4**	..
11	4	3	..	..	9	**16**	..
10	8	7	1	7	26	**49**	..
9	19	15	..	9	70	**113**	..
8	38	20	5	20	52	**135**	..
7	74	75	6	18	12	**185**	..
6	115	120	5	22	11	**273**	..
5	140	142	7	31	13	**333**	..
4	72	50	6	69	12	**209**	..
3	3	..	..	90	7	**100**	..
2	..	..	..	4	2	**6**	..
0-gr. No. of specimens	474	435	30	270	214	**1423**	..
— Specimens not measured	1400	400	0	192	247	**2250**	..
— Average length	*6,4*	*6,5*	*6,5*	*5,2*	*8,4*	*6,51*	..
I-gr. No. of specimens	0	0	0	21	9	..	**30**
— Average length	..	..	..	*22,6*	*(16,5)*	..	*20,2*
Total No.	1874	835	30	483	470	**3703**	

Table VII. $^{16}/_{7}$—$^{31}/_{7}$.

Year	1905	1912	1933		1939		$^{16}/_{7}$—$^{31}/_{7}$ Total		
Date	$^{24}/_{7}$	$^{17}/_{7}$	$^{24-25}/_{7}$	$^{26}/_{7}$	$^{27}/_{7}$	$^{29}/_{7}$			
Station	127	19—21	4575	4582	6010	6011			
Locality	Thorshavn	Vestmanhavn	Vaag	Thorshavn	Thorshavn	Kongshavn			
No. of hauls	2	6	7	4	2	3	24		
cm							0-gr.	I-gr.	II-gr.
46	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..	..	..
39	..	..	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..	..	..
36	..	..	..	..	..	..	..	..	..
35	..	..	..	..	..	..	..	..	..
34	..	..	..	..	..	..	..	..	..
33	..	..	..	..	..	..	..	..	..
32	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..	..	..
29	..	..	1	..	..	1	..	**1**	**1**
28	..	..	..	..	..	..	..	..	..
27	..	..	3	1	..	..	..	**4**	..
26	..	..	2	..	..	..	..	**2**	..
25	..	..	4	2	..	—	..	**6**	..
24	..	..	4	3	..	..	..	**7**	..
23	..	..	15	..	..	..	..	**15**	..
22	..	..	35	3	..	..	..	**38**	..
21	..	..	41	..	..	2	..	**43**	..
20	..	..	34	2	..	5	..	**41**	..
19	..	..	27	1	..	5	..	**33**	..
18	..	..	12	1	..	4	..	**17**	..
17	..	..	1	..	..	3	..	**4**	..
16	..	..	4	—	..	4	..	**8**	..
15	..	..	—	..	..	2	..	**2**	..
14	..	..	3	1	..	..	4	..	..
13	..	..	9	3	..	—	**12**	..	..
12	1	..	5	4	2	3	**15**	..	..
11	11	..	3	26	12	2	**54**	..	..
10	29	..	13	56	18	3	**119**	..	..
9	37	..	61	65	20	11	**194**	..	..
8	28	..	102	86	21	12	**249**	..	..
7	11	..	141	104	16	22	**294**	..	..
6	16	..	121	92	22	35	**286**	..	..
5	11	..	108	126	14	58	**317**	..	..
4	..	..	85	64	12	21	**182**	..	..
3	..	..	7	4	2	1	**14**	..	..
2	..	..	..	..	..	..	..	..	..
0-gr. No. of specimens	144	0	658	631	139	168	**1740**	..	..
— Specimens not measured	0	785	3901	0	0	0	**4686**	..	..
— Average length	*8,9*	..	*7,1*	*7,5*	*8,1*	*6,6*	*7,42*	..	..
I-gr. No. of specimens	0	0	183	13	0	25	..	**221**	..
— Average length	..	..	*21,4*	*23,0*	..	*18,7*	..	*21,18*	..
Total No.	144	785	4742	644	139	193 +1 II-gr.	**6647**		**+1**

Table VIII. $^{1}/_{8}$—$^{15}/_{8}$.

Year	1903	1908	1912						1924								1926			
Date	$^{12}/_{8}$	$^{4}/_{8}$	$^{2}/_{8}$	$^{2}/_{8}$	$^{3}/_{8}$	$^{6-7}/_{8}$	$^{10}/_{8}$	$^{12}/_{8}$	$^{2}/_{8}$	$^{2}/_{8}$	$^{3}/_{8}$	$^{4}/_{8}$	$^{4}/_{8}$	$^{7}/_{8}$	$^{9}/_{8}$	$^{10}/_{8}$	$^{4-5}/_{8}$	$^{5-7}/_{8}$	$^{8}/_{8}$	$^{8-9}/_{8}$
Station	210	93	22	23	24	25—26	29	30	2230	2232	2236	2244	2246	2247	2249	2252	2978	2983	2987	2996
Locality	Vaag	Thorshavn	Lopra	Vaag	Vaag	Vaag	Vaag	Vaag	Kongshavn	Skaale Fjord	Vaag	Trangisvaag	Kalbaks Fjord	Thorshavn	Kollefjord	Kvalvig	Skaale Fjord	Thorshavn	Trangisvaag	Vaag
No. of hauls	1	5	1	1	3	6	2	4	4	2	6	4	3	4	2	6	9	9	4	22
cm																				
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
44	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
41	..	..	..	..	..	..	..	..	..	—	..	..	..	..	..	..	..	..	..	..
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
39	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
38	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
37	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	1
36	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	3
35	..	..	..	..	..	..	..	..	..	14	..	..	..	..	..	..	..	..	..	2
34	..	—	..	..	..	..	..	..	..	28	..	..	..	..	..	..	..	..	..	3
33	..	..	..	..	..	..	..	..	..	38	..	..	..	..	..	..	..	..	..	2
32	..	..	..	..	..	..	..	..	..	45	..	..	..	..	..	..	..	..	..	1
31	..	..	..	..	..	..	..	..	..	30	..	..	..	..	..	..	..	..	..	—
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
29	..	5	..	..	..	..	..	..	..	34	..	..	..	..	..	..	..	..	..	7
28	..	4	..	..	..	..	..	..	..	11	..	..	..	..	..	..	..	..	..	5
27	..	24	..	..	..	..	..	..	..	7	..	..	..	..	..	..	..	..	..	8
26	..	26	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	12
25	..	57	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	38
24	..	102	..	..	..	..	..	..	..	—	1	..	1	..	..	..	1	..	2	47
23	..	78	..	..	..	..	..	..	..	..	2	2	1	..	..	..	6	..	1	38
22	..	32	..	..	..	..	..	..	..	1	1	3	2	..	1	..	20	..	1	14
21	..	11	..	..	..	..	..	..	..	..	..	2	8	..	..	..	29	..	1	6
20	..	2	..	..	..	..	..	..	..	1	1	1	19	..	7	1	25	..	..	1
19	..	..	..	..	..	..	..	..	..	4	1	1	22	..	4	..	6	..	..	..
18	..	..	..	..	..	..	..	..	..	13	..	..	9	..	5	..	1	..	..	..
17	..	..	..	..	..	..	..	..	..	26	1	1	2	..	1	1	1	..	—	—
16	..	—	..	1	..	..	..	..	1	28	..	..	..	..	3	..	..	..	..	..
15	..	..	..	4	..	..	..	..	..	6	..	..	..	..	2	..	—	..	..	1
14	..	..	..	3	..	..	1	..	..	1	—	—	..	..	..	..	..	1	..	1
13	1	2	2	15	2	..	5	..	—	1	..	..	—	..	..	—	7	1	1	1
12	1	27	6	16	8	..	9	..	..	..	..	8	..	..	..	..	37	6	1	3
11	1	71	1	20	15	..	26	..	1	—	7	37	..	..	..	..	76	12	7	25
10	7	28	1	21	29	..	66	..	28	18	36	131	4	..	..	1	110	25	11	25
9	12	12	5	37	40	..	179	..	59	64	97	174	4	..	..	..	82	42	8	24
8	99	9	4	70	61	..	520	..	46	25	60	151	1	..	..	1	26	35	5	51
7	44	3	1	74	171	..	666	..	44	2	103	146	2	..	..	..	4	50	9	51
6	104	..	..	18	120	..	230	..	88	..	131	122	3	..	..	1	1	54	6	38
5	321	..	..	1	22	..	33	..	72	1	180	240	1	..	..	..	..	34	1	16
4	95	..	..	..	..	..	..	..	49	1	205	147	2	..	..	..	..	5	..	..
3	8	..	..	..	..	..	..	..	3	..	32	5	..	..	..	..	..	..	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0-gr. No. of specimens	693	152	20	280	468	0	1735	0	390	111	851	1161	17	0	0	3	343	265	49	236
— Specimens not measured	0	0	0	0	350	1200	1000	1625	0	0	0	0	0	0	0	0	0	0	0	0
— Average length	*6,2*	*11,1*	*10,7*	*9,4*	*7,9*	..	*8,1*	..	*7,1*	*9,1*	*6,5*	*7,5*	*8,1*	..	..	*8,6*	*10,6*	*8,1*	*9,2*	*8,5*
I-gr. No. of specimens	0	341	0	0	0	0	0	0	1	81	8	10	64	0	23	2	90	0	5	178
— Average length	..	*24,6*	..	..	..	..	..	..	*(16,5)*	*17,3*	*(22,1)*	*21,5*	*20,1*	..	*18,4*	*(19,0)*	*21,4*	..	*(23,3)*	*24,9*
II-gr. No. of specimens	0	1	0	0	0	0	0	0	0	215	0	0	0	0	0	0	0	0	0	12
— Average length	..	*(39,5)*	..	..	..	..	..	..	..	*32,3*	..	..	..	..	..	..	..	..	..	*35,1*
Total No...	693	494	20	280	818	1200	2735	1625	391	407 +1 III-gr.	859	1171	81	0	23	5	433	265	54	426

Table VIII (continued).

Year	1931			1932								1938			1939		$^{1}/_{8}$—$^{15}/_{8}$ Total
Date	$^{7}/_{8}$	$^{8-9}/_{8}$	$^{9-10}/_{8}$	$^{1}/_{8}$	$^{1}/_{8}$	$^{2}/_{8}$	$^{2}/_{8}$	$^{2-3}/_{8}$	$^{3-4}/_{8}$	$^{5}/_{8}$	$^{6}/_{8}$	$^{1}/_{8}$	$^{3}/_{8}$	$^{4}/_{8}$	$^{14}/_{8}$	$^{15}/_{8}$	
Station	4272	4276	4283	4491	4492	4493	4497	4498	4500	4503	4504	6021	6025	6026	6233	6234	
Locality	Vaag	Skaale Fjord	Kolle-fjord	Thors-havn	Fugle-Fjord	Skaale Fjord	Kolle-fjord	Thors-havn	Klaks-vig	Orde-vig	Vaag	Fugle-fjord	Orde-vig	Vaag	Fugle-fjord	Klaks-vig	
No. of hauls	11	18	10	7	5	10	4	17	20	14	7	4	4	4	4	4	241
cm																	0-gr. I-gr. II-gr. III-gr.
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. ..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. ..
44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. .. **1**
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	.. .. .. **1**
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. ..
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	—	.. ..
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. ..
39	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. **1** ..
38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. **1** ..
37	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	.. .. **5** ..
36	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. **6** ..
35	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	.. .. **18** ..
34	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. **31** ..
33	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	.. **1** **41** ..
32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.. .. **46** ..
31	—	..	..	..	4	..	..	—	..	—	..	—	..	..	..	..	.. **4** **30** ..
30	..	..	..	..	10	..	..	..	..	..	..	..	..	..	..	..	.. **12** .. ..
29	..	1	..	..	12	..	..	1	..	..	..	1	..	..	..	—	.. **27** **34** ..
28	..	1	..	1	24	..	..	5	..	..	..	1	1	..	..	..	.. **42** **11** ..
27	1	1	..	..	29	..	..	14	3	..	..	..	..	1	..	..	.. **81** **7** ..
26	..	..	1	..	31	..	..	18	5	..	..	4	1	..	..	1	.. **99** **1** ..
25	..	2	4	3	24	..	..	34	5	1	..	7	..	..	..	4	.. **181** .. ..
24	2	3	1	1	22	..	..	37	11	1	1	4	..	1	1	2	.. **241** .. ..
23	12	9	8	2	15	3	..	43	16	..	..	6	..	1	1	1	.. **245** .. ..
22	8	18	6	..	8	2	..	14	16	..	1	4	..	2	..	3	.. **157** .. ..
21	21	20	17	..	1	3	..	6	15	..	..	3	..	..	..	5	.. **148** .. ..
20	7	36	10	..	1	4	1	2	6	..	..	3	..	1	..	4	.. **133** .. ..
19	12	34	12	..	..	4	7	1	..	..	1	1	..	..	..	4	.. **114** .. ..
18	3	20	16	..	..	3	5	..	..	..	..	4	..	..	..	2	.. **81** .. ..
17	3	7	5	—	..	1	7	..	—	—	—	—	1	..	—	3	.. **60** .. ..
16	2	2	2	..	—	..	2	..	..	..	..	..	..	—	..	2	**1** **42** .. ..
15	1	—	..	1	..	—	..	..	3	..	4	1	..	..	..	1	**16** **8** .. ..
14	2	1	—	16	..	..	—	..	4	1	2	..	—	..	2	5	**39** **1** .. ..
13	4	1	1	38	5	1	..	..	9	..	4	..	..	..	5	10	**115** **1** .. ..
12	5	8	2	48	11	6	2	..	11	1	4	10	..	..	6	12	**248** .. .. ..
11	15	20	6	108	25	5	6	..	30	10	8	14	8	..	17	24	**595** .. .. ..
10	32	40	10	119	31	5	6	..	39	21	18	15	8	2	6	38	**931** .. .. ..
9	45	39	13	69	34	6	3	..	28	27	37	10	13	10	9	40	**1222** .. .. ..
8	61	16	7	46	40	1	2	..	38	36	51	9	9	33	14	44	**1571** .. .. ..
7	146	10	5	21	42	..	1	..	50	67	66	19	25	64	34	35	**1955** .. .. ..
6	179	2	1	12	87	..	..	..	77	71	98	23	49	109	46	23	**1693** .. .. ..
5	130	7	..	3	194	..	..	..	67	52	82	33	40	90	186	27	**1833** .. .. ..
4	48	2	..	1	430	..	..	..	24	12	15	81	49	43	423	6	**1638** .. .. ..
3	..	..	..	..	128	..	..	..	6	2	2	33	20	..	45	..	**284** .. .. ..
2	1	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	**6** .. .. ..
0-gr. No. of specimens	669	146	45	482	1032	24	20	0	386	300	391	248	221	351	793	265	**12147** .. .. ..
— Specimens not measured	0	0	0		195	0	0	476	862	133	800	718	0	2238	804	473	**10874** .. .. ..
— Average length	*7,*	*9,7*	*9,8*	*10,7*	*5,6*	*11,0*	*10,5*	..	*8,0*	*7,5*	*7,4*	*6,4*	*6,3*	*6,4*	*5,4*	*8,5*	*7,51* .. .. ..
1-gr. No. of specimens	71	154	82	7	182	20	22	175	77	2	3	38	3	6	2	31	.. **1678** .. ..
— Average length	*21,3*	*20,7*	*20,7*	*(25,2)*	*26,6*	*19,7*	*18,4*	*23,7*	*23,3*	*(25,0)*	*(22,2)*	*23,5*	*(24,2)*	*(23,5)*	*(24,0)*	*21,2*	.. *23,04* .. ..
II-gr. No. of specimens	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	.. .. **234** ..
— Average length	*(35,5)*	..	..	..	..	..	..	*(37,5)*	..	*(35,5)*	..	*(33,5)*	..	..	..	..	.. .. *32,61* ..
Total No.	741	300	127	489	1409	44	42	652	1325	436	1194	1005	224	2595	1599	769 +1 III-gr.	**14932** +2

Table IX. $^{16}/_{8}$—$^{31}/_{8}$.

Year	1903							1911					1912	
Date	$^{17}/_{8}$	$^{19}/_{8}$	$^{25}/_{8}$	$^{25}/_{8}$	$^{26}/_{8}$	$^{29}/_{8}$	$^{27}/_{8}$	$^{19}/_{8}$	$^{21}/_{8}$	$^{25}/_{8}$	$^{29}/_{8}$	$^{31}/_{8}$	$^{17}/_{8}$	$^{19}/_{8}$
Station	215	218	231	231	232	235	234	1	2	3	4	6	31	32
Locality	Sande-vaag	Vestman-havn	Funding Fjord	Funding Fjord	Fugle-fjord	Trangis-vaag	Thors-havn	Thors-havn	Kalbaks Fjord	Vestman-havn	Vestman-havn	Vestman-havn	Thors-havn	Kalbaks Fjord
No. of hauls	2	3	1	1	4	4	5	4	5	7	8	2	3	3
cm														
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	1	..	.
44	..	..	..	..	..	..	..	..	..	..	..		.	
43	..	..	..	..	..	..	..	..	..	..	..	2		
42	..	..	..	..	..	..	..	..	..	..	..	3	.	
41	..	..	..	..	.	..	..	..	..	.	..	5	.	
40	..	..	..	..	..	..	..	..	..	..	..	41		
39	..	..	..	..	..	..	..	..	..	..	..	30		
38	..	..	..	..	..	..	..	..	..	..	..	17		
37	..	..	..	..	..	..	..	..	..	.	..	20		
36	..	..	..	..	..	..	..	..	..	..	.	12	..	
35	..	..	..		..	..	..	..	..	..	.	.	.	
34	..	..	..	..	..	..	..	..	..	..	..	4	.	
33	..	..	..	..	..	..	..	..	..	..	.	1	.	.
32	..	..	..	..	..	..	..	..	..	.	.	—	..	
31	..	..	..	..	..	..	..	..	..	..	.	1	.	
30	..	..	..	..	..	..	..	..	..		.	1	..	
29	..	..	..	..	..	..	..	.	..	.	.	2		
28	..	..	..	..	..	..	..	..	..	.	.	.	.	
27	..	..	..	..	..	..	1	..	.	.	.	3	..	
26	..	1	..	..	..	..	..	..	..	.	.	8	.	
25	..	1	..	..	..	..	..	..	..	.	.	5	.	
24	..	..	..	..	..	2	..	..	.	..	.	1	..	
23	..	1	..	..	..	2	..	..	..	.	.	5	..	
22	..	..	..	..	..	..	..	..	3	.	..	..	.	.
21	..	..	..	..	..	..	..	..	..	..	.	1	.	
20	..	..	..	..	..	1	..	.	.	.	.	.	..	
19	..	..	..	..	..	..	..	..	..			..	..	.
18	..	—	..	..	..	—	—	.	—	.	.	—	..	
17	..	1	.	..	..	..	..	.	.	1	.	..	.	
16	..	1	..	..	..	1	..	..	..	5	.	1	..	
15	..	4	..	..	.	..	.	1		9	2	4	1	
14	29	2	3	..	..	4	1	.		46	7	9	10	
13	133	6	4	..	..	7	..	4		89	53	27	25	.
12	145	20	6	..	..	19	1	10	2	115	64	59	31	
11	82	33	6	..	1	79	..	17	7	173	123	134	24	8
10	36	52	2	..	..	229	..	38	14	138	138	91	19	14
9	12	99	2	..	..	144	..	17	9	113	80	77	16	35
8	2	84	..	..	4	36	..	10	6	84	77	60	9	137
7	1	115	..	23	6	36	..	9	4	72	69	51	5	104
6	..	523	..	71	57	36	..	5	..	43	37	33	3	12
5	..	704	..	96	86	18	..	1	1	15	6	16	.	
4	.	425	..	37	34	3	.	..		1		..	..	.
3	1	40	..	..	..	..	..	..	..	..	.	..	..	..
2	..	..	..	..	..	..	..	.	.	..	.	..	..	..
0-gr. No. of specimens	441	2109	23	227	188	612	2	112	43	904	656	562	143	310
— Specimens not measured	0	0	0	1900	1876	0	175	0	0	3000	'1400	0	95	250
Average length	*12,5*	*6,3*	*12,2*	*5,9*	*5,8*	*9,8*	..	*10,2*	*9,9*	*10,7*	*10,2*	*10,2*	*11,5*	*8,1*
I-gr. No. of specimens	0	3	0	0	0	5	1	0	3	0	0	27	0	0
— Average length	..	*(25,2)*	..	..	..	*(23,3)*	*(27,5)*	..	*(22,5)*	..	..	*26,2*	.	.
II-gr. No. of specimens	0	0	0	0	0	0	0	0	0	0	0	136	0	0
— Average length	..	..	..	..	..	..	..	.	..	..	..	*39,2*	..	.
Total No.	441	2112	23	2127	2064	617	178	112	46	3904	2056	725	238	560

Table IX (continued).

Year	1925					1927						1933		1939		$^{16}/_{8}$—$^{31}/_{8}$ Total		
Date	$^{17}/_{8}$	$^{17}/_{8}$	$^{17}/_{8}$	$^{17-18}/_{8}$	$^{19}/_{8}$	$^{22}/_{8}$	$^{24}/_{8}$	$^{25}/_{8}$	$^{26}/_{8}$	$^{26}/_{8}$	$^{29}/_{8}$	$^{29}/_{8}$	$^{31}/_{8}$	$^{16}/_{8}$	$^{17}/_{8}$			
Station	2471	2472	2474	2475	2479	3298	3311	3319	3323	3327	3329	4702	4709	6235	6236			
Locality	Thors-havn	Kongs-havn	Skaale Fjord	Thors-havn	Vaag	Skaale Fjord	Fugle-fjord	Thors-havn	Kval-vig	Kolle-fjord	Kongs-havn	Klaks-vig	Vaag	Trangis-vaag	Vaag			
No. of hauls	5	3	2	6	6	8	6	4	4	5	8	12	7	4	4	136		
cm																0-gr.	I-gr.	II-gr.
46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
43	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
42	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	41
40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	30
39	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17
38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	20
37	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12
36	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
34	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4
33	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
32	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
30	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	2	..
29	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	4	..
28	1	..	..	1	1	..	..	..	..	..	..	..	3	..	..	..	6	..
27	4	..	..	15	2	..	..	..	..	..	..	1	1	..	..	..	27	..
26	5	..	..	22	18	..	..	..	..	..	..	..	2	..	4	..	60	..
25	1	1	..	23	28	..	..	..	..	..	..	..	3	..	1	..	63	..
24	2	1	..	33	37	..	..	..	..	1	..	1	..	..	4	..	82	..
23	2	1	..	25	48	2	..	..	..	..	..	2	3	..	5	..	96	..
22	1	2	3	17	33	2	..	..	..	..	3	2	..	..	2	..	68	..
21	..	2	2	14	14	5	..	..	3	..	10	2	..	..	2	..	55	..
20	..	4	5	6	5	13	..	..	2	3	49	1	1	..	..	..	90	..
19	..	1	7	3	2	17	..	..	3	7	77	1	..	..	..	..	118	..
18	—	..	6	1	..	19	..	..	1	6	94	1	—	..	—	..	128	..
17	..	..	3	1	..	10	..	..	1	2	100	—	1	..	..	3	117	..
16	..	—	3	—	—	1	..	..	1	..	62	4	1	..	2	15	67	..
15	..	..	1	2	..	2	..	..	..	..	28	25	2	..	1	51	31	..
14	..	..	1	12	9	—	..	..	—	—	8	40	3	..	2	178	8	..
13	6	3	1	16	11	2	..	..	..	..	4	49	4	6	4	454	..	..
12	14	6	4	37	38	8	2	..	4	2	26	51	9	11	15	699	..	..
11	18	14	18	49	67	7	1	..	5	3	22	58	10	28	29	1015	..	..
10	21	22	18	68	107	1	3	..	2	4	37	56	41	43	28	1222	..	..
9	18	13	11	49	164	2	6	..	3	..	32	81	92	49	38	1162	..	..
8	13	11	3	17	178	..	4	..	..	..	12	122	138	105	38	1150	..	..
7	4	9	1	14	246	1	4	..	..	..	1	138	64	99	32	1108	..	..
6	2	5	1	6	258	..	7	..	..	..	1	89	29	46	22	1286	..	.
5	4	..	..	7	126	..	8	..	..	..	..	32	6	10	8	1144	..	.
4	..	..	..	..	13	..	6	..	..	..	..	1	1	..	1	523	..	..
3	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	42	..	..
2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0-gr. No. of specimens	100	83	58	277	1217	21	42	0	14	9	135	746	401	397	220	10025	..	..
— Specimens not measured	0	0	0	0	0	0	0	0	0	0	0	1560	448	0	0	10703	..	..
— Average length	*10,3*	*9,9*	*10,7*	*10,7*	*8,2*	*11,6*	*7,4*	..	*11,2*	*(11,3)*	*10,7*	*9,6*	*8,9*	*8,7*	*9,4*	*8,89*	..	..
I-gr. No. of specimens	16	12	30	162	189	71	0	0	11	19	431	11	14	0	18	..	1023	..
— Average length	*25,9*	*21,9*	*19,3*	*24,3*	*23,9*	*19,3*	..	..	*19,7*	*19,4*	*18,2*	*22,3*	*26,0*	..	*24,2*	..	*21,08*	..
II-gr. No. of specimens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	..	..	136
— Average length	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	*40,15*
Total No...	116	95	88	439	1406	92	42	0	25	28	566	2317	863	397	238	21887		

Table X. $^{1}/_{9}$—$^{15}/_{9}$.

Year	1903		1911			1927		1933	$^{1}/_{9}$—$^{15}/_{9}$ Total		
Date	$^{5}/_{9}$	$^{9}/_{9}$	$^{1}/_{9}$	$^{5}/_{9}$	$^{6}/_{9}$	$^{1}/_{9}$	$^{3}/_{9}$	$^{1}/_{9}$			
Station	241	244	5	8	9	3333	3340	4713			
Locality	Kollefjord	Vaag	Vestmanhavn	Ørdevig	Trangisvaag	Trangisvaag	Vaag	Ørdevig			
No. of hauls	5	8	4	5	5	9	12	8	56		
									0-gr.	I-gr.	II-gr.
cm											
46	..	..	2	..	..	..	..	..	..	..	**2**
45	..	..	1	..	..	..	..	..	..	..	**1**
44	..	..	3	..	..	..	..	..	..	..	**3**
43	..	..	1	..	..	..	..	..	..	..	**1**
42	..	..	7	..	..	..	..	..	..	..	**7**
41	..	..	28	..	..	..	..	..	..	..	**28**
40	..	..	93	..	..	1	..	..	..	..	**94**
39	..	..	66	..	..	..	..	..	..	..	**66**
38	..	1	29	..	..	..	..	..	..	..	**30**
37	..	..	33	..	..	..	..	..	..	..	**33**
36	..	..	16	..	..	..	1	..	..	..	**17**
35	..	3	3	..	..	1	..	..	..	..	**7**
34	..	1	7	..	..	..	..	..	..	..	**8**
33	..	..	—	..	..	1	—	..	..	..	**1**
32	..	1	..	..	..	..	..	..	..	..	**1**
31	..	..	1	..	..	..	..	..	..	**1**	..
30	..	—	3	..	..	—	1	..	..	**4**	..
29	..	2	1	..	..	..	1	..	..	**4**	..
28	..	1	4	..	..	..	..	2	..	**7**	..
27	..	10	13	..	..	1	2	2	..	**28**	..
26	..	30	32	..	..	..	12	5	..	**79**	..
25	..	78	15	..	..	..	13	3	..	**109**	..
24	..	72	7	..	..	..	6	6	..	**91**	..
23	1	39	13	..	..	..	8	4	..	**65**	..
22	..	30	6	..	..	..	1	5	..	**42**	..
21	..	12	1	..	..	..	..	7	..	**20**	..
20	1	..	..	..	..	..	..	1	..	**2**	..
19	..	–2–	—	1	..	—	—	1	**2**	**2**	..
18	..	1	1	..	2	..	..	..	**4**	..	..
17	—	1	1	1	3	..	..	—	**6**	..	..
16	..	9	10	1	7	1	3	..	**31**	..	..
15	2	36	19	7	10	6	4	1	**85**	..	..
14	4	81	38	24	13	3	8	5	**176**	..	..
13	8	128	101	62	46	6	14	7	**372**	..	..
12	24	230	190	123	84	5	24	21	**701**	..	..
11	12	396	288	68	46	39	42	40	**931**	..	..
10	5	220	218	76	32	132	90	45	**818**	..	..
9	10	87	175	44	16	128	84	61	**605**	..	..
8	1	211	150	28	10	46	73	25	**544**	..	..
7	14	278	117	11	3	31	43	23	**520**	..	..
6	38	297	66	7	..	13	22	11	**454**	..	..
5	15	65	35	1	..	11	6	2	**135**	..	..
4	5	5	..	..	..	2	..	..	**12**	..	..
3	..	1	..	..	..	..	..	..	**1**	..	..
2	..	..	..	..	..	..	..	..	..	..	..
0-gr. No. of specimens	138	2047	1409	454	272	423	414	241	**5397**	..	..
— Average length	*9,0*	*10,0*	*10,5*	*11,6*	*12,3*	*9,8*	*9,8*	*10,1*	*10,43*	..	..
I-gr. No. of specimens	2	275	96	0	0	1	44	36	..	**454**	..
— Average length	*(22,0)*	*24,6*	*25,9*	..	..	*(27,5)*	*25,5*	*24,0*	..	*24,95*	..
II-gr. No. of specimens	0	6	289	0	0	3	1	0	..	..	**299**
— Average length	..	*(35,3)*	*39,6*	..	..	*(36,5)*	*(36,5)*	..	..	..	*39,44*
Total No....	140	2328	1794	454	272	427	459	277	**6150**		

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